THE ENGINEERING AND MINING JOURNAL.

RICHARD P. ROTHWELL, C. E., M. E.
ROSSITER W. RAYMOND, Ph. D. } Editors.

NOTE.—Communications relative to the editorial management should be addressed to Mr. ROTHWELL. The articles written by Mr. Raymond will be signed with a star.

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THE HUNT & DOUGLAS PROCESS AT GEORGETOWN, COL.

WE beg to direct the attention of our readers to the correspondence by Mr. D. W. BRUNTON, of Georgetown, Col., in another column.

It appears from this that the office of the "HUNT & DOUGLAS liquor" is henceforth to be that of a chloridizer only, and that calcic hyposulphite is to be used as the solvent of the silver chloride. In view of the fact that ferrous chloride, even in combination with salt, is, comparatively speaking, one of the *less* efficient solvents of silver chloride, this change in the original process is a very important one.

In the description of the present process Mr. BRUNTON says, however, nothing about the solution of part of the silver in the bath of ferrous chloride, etc. Are we to infer that none is dissolved? If so, how is this brought about?

The total abandonment of amalgamation, and the introduction of leaching with calcic hyposulphite instead is, no doubt, a step in advance. But as to the *dictum* of Mr. BRUNTON, that amalgamation can only be carried to within five to ten per cent. of the chlorination, we beg to differ. According to our experience, this should rather read "within two to three per cent."

But aside from all this we think that for Georgetown ores, or ores similar to them in composition, in short silver ores containing a considerable amount of the base metals, the process as intended to be practised henceforth by Mr. STEWART is a good and economical one. Whether ferrous chloride, as a chloridizer, is to be used in addition to the roasting in other districts must, of course, in each individual case, depend on the amount of base metals in the charge, and on the care bestowed on the roasting process. The employment of the Patera process, with or without this modification, will, we trust, be more generally introduced hereafter in the United States, and, no doubt, results will follow it here, after it is once thoroughly understood, fully as satisfactory as those obtained in Austria and in Mexico.

THE SILVER STANDARD.

DURING the present week, the price of silver has touched the unprecedently low figure of $1.14 gold per ounce, a decline of more than 12 per cent. from the price of a few years ago. It is said that the Director of the Mint expects the large proportion of gold in the Comstock bullion to make itself felt before long in checking the downward course of the silver ratio. We trust he will prove to be right; and we have reason to put faith in his intelligent foresight of the matter. For ourselves, we are more alarmed at the indications appearing in several quarters that a serious attempt will be made to substitute silver for gold, as the United States standard of currency, or, what is more absurd though not more mischievous, to introduce again the principle of a double standard, and make both gold and silver coins legal tender in all amounts. The danger appears to be that the "soft-money" men and the trimmers among the hard money men and the demagogues in search of a novel political watchword will strike hands with a few keen representatives of the silver mining industry of the Pacific Slope, and rush through one of these schemes, as a sort of return to specie payments.

It is disheartening to be obliged, in the presence of financial problems involving real and deep difficulties, to go back to the discussion of elementary questions which the world has settled. The accounts of the commercial world are referred to gold as a standard, and its balances are settled in that currency. The time when other nations, convinced of the advantages of the gold standard, are demonetizing silver, and relegating it to its proper place as the material of a purely subsidiary currency, is not a time when this country should deliberately prepare for itself all the inconveniences and evils from which they are at last escaping. Still less reasonable does such a step appear, in view of the rapid change in the value of silver. It is true that this value is measured in gold, and that ingenious financiers may say it is gold, not silver, which is fluctuating, just as similar philosophers have always protested that gold, not greenbacks, was going up and down in exchange. But men of sense will note two things: first, that the prices of commodities, the world over, are measured in gold; and that the price of silver has been falling for many months, without raising the prices of commodities; secondly, that the supply of silver has been suddenly and enormously increased, and that this, together with its demonetization abroad, is the cause of its fall in price. The greater stability of gold is therefore a palpable fact. If silver were legal tender for all amounts to-day, the industry of the country would be at the mercy of the operations in Nevada, which is not much better than its present dependence upon operations in Wall street.

The notion of a double standard is an exploded fallacy. It is an attempt to fix by legislation the relative value of the two metals; and the market value, following other and higher laws, defies such regulation. The result is, that the metal which is undervalued in coinage inevitably disappears from circulation. What relative value, pray, could now be given by law to gold and silver in legal-tender coinage, which would afford the least security of a simultaneous circulation of both? We have seen it suggested that the proportion of 1 to 16 should be adopted. Suppose, then, that the United States should offer to pay the public creditors sixteen ounces of silver coin in lieu of one ounce of gold coin, when they can buy in the market for an ounce of gold, eighteen ounces of silver. Could there be a meaner form of repudiation than that? But aside from the question of honor involved, the step would inevitably drive all gold from circulation. Gold coin would be held at a premium for melting or export; and we should have practically but one standard, that of a debased, fluctuating silver currency. If the ratio were established to suit more nearly the present market values, what security is there that these will not again suffer sudden change? Is the Bonanza going to hold out forever? May not the increased proportion of gold (now nearly one-half, it is said) in the Comstock bullion, check the fall of silver, or turn the current the other way? In whatever light it is regarded, the proposed establishment of a silver standard appears to be the worst of policies, suggested at the worst of times.

Even for the purposes which its advocates have in view, it is either unnecessary or inadequate. There is no objection to the reinstatement of silver for the subsidiary currency, legal tender in small amounts; nor would the fluctuations of the metal below its coinage valuation affect its circulation in that sphere. But the attempt to stop its market decline by legislating a fictitious value upon it is fore-ordained to fail, and in failing to disgrace and torment the country.

*

OHIO COAL MINING STATISTICS FOR 1875.

MR. ANDREW ROY, Inspector of Mines for Ohio, has just issued his report for the year 1875. It is a more interesting document than we are generally accustomed to in our official State literature, and contains many suggestions of practical value. Thus Mr. ROY calls attention to the dangers which attend the use of a furnace for ventilation, even when the mine is provided with two openings. He says "the furnace is placed directly at the bottom of the air shaft, and the heat, smoke, and gases evolved from the fire would forbid any attempt at exit until after the fire was put out and the side of the shaft cooled down. A fire occurring at the main opening (downcast shaft) would, as soon as sufficient heat were communicated to the burning timbers over and in the shaft, to render the air specifically lighter than the air in the furnace-shaft, reverse the ventilating current, and the smoke and gases from the furnace would spread through the mine and endanger the lives of the whole underground population."

Mr. ROY strongly recommends the use of ventilating fans instead of furnaces. He also recommends that provision be made by the State for a mining department in the Agricultural and Mechanical College, "so that the young men of the mines may have an opportunity of a scientific training in their art." As he well remarks, in no country but the United States is a mining superintendent allowed to assume charge of the underground departments of mines before first passing a satisfactory examination before a board of examiners and receiving a certificate of competency.

A considerable part of this report is to be found in Mr. ROY's book on "The Coal Mines," which has recently appeared, and has been awaiting its turn for review on our table for some time. The information given on ventilation and the working of mines generally, though not startling by its originality, will, doubtless, serve a good purpose by attracting the attention of the miners and by giving them generally very correct views on the most important practical questions that occur in mining.

Mr. ROY thus summarizes the accidents, etc., for the year 1875, as compared with 1874:

"The returns came in very slowly, and some have not been returned up to the present time. The various companies are unusually busy settling up the business of the year. However, as the report did not go to press until the 1st of February, I delayed making any calculation until that time. Statistics are without value if they are not correct. I must add that some of the coal companies are adverse to furnishing a statement of the amount of coal mined by them, and few of them care to have the out-put of their mines published, except as forming part of the aggregate yield of the county or State.

"The number of fatal accidents which occurred during the year, in and around the coal mines of the State, amounts to twenty-four; twenty-one of the unfortunate persons were killed inside, and three outside. Eleven of these fatal accidents were caused by falls of roof and coal; four were caused by the caving in of a shaft in course of sinking; three by premature explosions; two by being run over by cars; two by falling down shafts, and the other three from other causes. The aggregate amount of people employed in and around the mines is 13,667, of whom 12,096 work in the mines, and 1,373 work on top. The amount of coal mined was 4,868,252 tons. Part of the yield was estimated, no returns being sent in from the mines, but the above statement of the out-put of coal is

at least approximately correct. One fatal accident, according to the above figures, occurred for every 202,677 tons of coal mined, and for every 561 persons employed.

In 1874 twenty-seven fatal accidents were reported, but three others, one of which occurred in Trumbull County, one in Perry County, and one in Tuscarawas County, were not returned in time for the report. My estimate of the coal production of the State for 1874 was stated at 2,820,000 tons, but later returns showed the out-put to be equal to 4,267,585 tons. The number of persons employed were 12,500. One death was then caused for every 142,252 tons mined, and for every 417 persons employed. The number of serious accidents which occurred in 1874 amounted to eighty. This year only forty have been returned. There is, however, a probability that all the serious accidents were not reported, for in mining, as in war, there are three crippled to one killed.

THE NUMBER OF MINERS AND AMOUNT OF COAL MINED IN THE SEVERAL COUNTIES DURING THE YEAR 1875.

COUNTIES.	No. of Mines.	Production in tons.	No. of drifts.	No. of slopes.	No. of shafts.	Total number.
Athens	887	329,530	12	0	4	16
Belmont	514	213,955	10	5	1	16
Carroll	150	60,000	5	1	1	7
Columbiana	967	332,446	18	1	1	20
Coshocton	251	90,669	9	0	0	9
Guernsy	295	135,425	4	0	1	5
Gallia	20	5,420	2	0	0	2
Hocking	429	170,034	3	0	0	3
Holmes	40	14,000	1	0	0	1
Harrison	10	5,300	1	0	0	1
Jefferson	465	195,265	7	0	13	20
Jackson	267	117,730	3	1	7	11
Lawrence	355	122,484	5	0	0	5
Medina	228	80,000	0	2	0	2
Mahoning	774	271,689	2	9	8	19
Muskingum*	380	109,480	10	0	1	11
Meigs	917	345,500	11	1	2	14
Noble	30	4,000	1	0	0	1
Perry	1,236	503,169	24	0	0	24
Stark	795	408,180	1	5	12	18
Summit	735	274,876	3	6	2	11
Tuscarawas	358	107,000	9	0	2	11
Trumbull	2,521	749,000	1	20	6	27
Vinton	225	56,356	4	1	0	5
Wayne	240	80,291	2	0	2	4
Washington	72	12,425	3	0	0	3
Small mines	300	80,000	.....	.....	.....	.....
Totals	13,669	4,868,252	151	52	63	266

* The estimated production of this county includes small mines.

AMERICAN INSTITUTE OF MINING ENGINEERS.

FEBRUARY MEETING HELD AT WASHINGTON, D. C.

THE first session of the Institute was held at the Smithsonian Institution on Tuesday evening the 22d, at 8 o'clock. The Institute was welcomed to Washington and to the Smithsonian by Professor JOSEPH HENRY, in an address which was published in last week's issue.

President HOLLEY responded to the cordial welcome of Professor HENRY on behalf of the Institute, and then read an introductory address on the subject of Technical Education, which is given on another page.

The subject was discussed by Prof. EGLESTON, Dr. R. W. RAYMOND, E. B. COXE, E. C. PECHIN, and J. D. WEEKS; this discussion will appear next week. The following names were then submitted to the Institute, with the endorsement of the Council for election as members or associates. The gentlemen named were unanimously elected. For convenience, the names of those elected at subsequent sessions of this meeting. are included in the list.

MEMBERS.

H. J. L. WARREN, Mining Engineer, Hotel Vendome, Boston, Mass.
WILLIAM PISTOR, Engineer of Mines, 413 W. 21st St, New York City.
CHANNING M. BOLTON, Civil Engineer, Richmond, Va.
Major J. W. POWELL, Washington, D. C.
Commander L. A. BEARDSLEE, Navy Department, Washington, D. C.
W. F. DURFEE, Civil Engineer, Tribune Building, New York City.
R. J. ANDERSON, Steel Manufacturer, Pittsburgh, Pa.
H. C. HUMPHREY, Chemist, 117 Walnut St., Philadelphia.
JAMES T. WALKER, Mechanical Engineer, Albany and Rensselaer Iron and Steel Company, Troy, N. Y.
ROBERT FRAZER, jr., 225 South 6th St., Philadelphia.
AMBROSE E. LEHMAN, Civil Engineer, 225 South 6th St., Philadelphia.
NELSON P. HULST, Chemist, Milwaukee, Wis.
HARVEY H. BROWN, Assistant Agent, Jackson Iron Company, Cleveland, Ohio.
Gen'l WM. SOOY SMITH, Maywood, Illinois.
JOHN STEVENSON, Mechanical Engineer, Edgar Thomson Steel Works, Pittsburgh, Pa.
CHARLES BENDER, Civil Engineer, 71 Broadway, New York City.
JAMES BURDEN, Troy, N. Y.
E. R. WAITE, Gas-Furnace Engineer, 119 South 4th street, Philadelphia.
Gen'l W. S. ROSECRANS, San Rafael, Cal.
J. P. CLEMES, Superintendent Trinidad Mine, Sonora, Mexico.
EMILE RECTOR ABADIE, Mining Engineer, 200 South 4th street, St. Louis, Mo.
E. STEINBACH, Metallurgist and Assayer, Del Norte, Colorado.
HEBER S. THOMPSON, Engineer Girard Estate, Pottsville, Pa.
J. PRICE WETHERILL, Resident Engineer P. & R. Coal and Iron Company, Tremont, Pa.
S. P. RABER, Superintendent Taylor Iron Works, High Bridge, N. J.
M. D. VALENTINE, Fire Brick Maker, Woodbridge, N. J.
CHARLES MCMILLAN, Professor of Civil Engineering, Princeton, N. J.
CALVIN E. BRODHEAD, Resident Engineer, Lehigh Valley and Easton & Amboy Rail Roads, Bethlehem, Pa.
LEWIS M. HAUPT, Professor of Civil Engineering, University of Pennsylvania Philadelphia.
JAMES S. POLHEMUS, Civil Engineer, U. S. Gov. Lake Survey, Detroit, Mich.
ARTHUR MACY, Civil Engineer, School of Mines, New York City.
JAMES P. WITHEROW, Ironton, Ohio.
DR. J. LAWRENCE SMITH, Louisville, Kentucky.
MAX MOREHEAD, Ironmaster, Pittsburgh, Pa.
HENRY W. OLIVER, Jr., LEWIS, OLIVER & PHILLIPPS, Pittsburgh, Pa.
B. F. JONES, JONES & LAUGHLIN, Pittsburgh, Pa.
Gen. E. BURD GRUBB, Burlington, N. J.
JOHN S. HOFFMAN, Mining Engineer, 208 South Fourth street, Philadelphia.
R. H. LEE, Superintendent Logan Iron & Steel Co., Lewistown, Pa.
M. L. BROSIUS, Supt. Standard Steel Works, Lewistown, Pa.
WM. GOLDING, Supt. Bessemer Department, Pennsylvania Steel Works, P. O., Dauphin County, Pa.
R. H. SANDERS, 139 South Fourth street, Philadelphia.
SAMUEL GRISCOM, Managing Director Diamond Drill Co., Pottsville, Pa.
A. J. WOMELSDORF, Mining Engineer, Pottsville, Pa.
FRANK P. WITHERBEE, Port Henry, Essex Co., N. Y.
LEWIS A. RILEY, Mining Engineer of Lehigh Valley Coal Company, Ashland, Schuylkill Co., Pa.
ARTHUR R. GUERARD, Geologist and Mining Engineer, 5 Rutledge avenue, Charleston, S. C.
N. S. KEITH, 41 Liberty street, New York City.
H. G. H. TARR, Superintendent Rock Hill Iron and Coal Company, Orbisonia, Huntingdon Co., Pa.
JOSEPH E. GALIGHER, Superintendent, "Bully Boy" Mine, Spanish Mines, Utah.
EDWARD P. JENNINGS, Civil Engineer, Assistant in Chemistry, Cornell University, Ithaca, N. Y.
EDWARD HART, Tutor in Chemistry, Lafayette College, Easton, Pa.
N. H. CONE, Manager Nederland Mill, Nederland, Colorado.
SAMUEL W. THOME, Furnace Inspector, Philadelphia and Reading Coal and Iron Company, Pottsville, Pa.
THOMAS E. BOWMAN, Assayer for, and Assistant in, Silverton Smelting Works, Silverton, La Plata County, Colorado.
E. S. HAWLEY, Superintendent Buffalo Iron and Nail Works, and Fletcher and Lillie Blast-Furnaces, 7 Forest avenue, Buffalo, N. Y.
General J. T. WILDER, Iron Master, Chattanooga, Tenn.
B. A. OXNARD, Mining Engineer, State and Dock streets, Brooklyn, N. Y.
A. B. SQUIRE, Cleveland, Ohio.
C. D. KINSMAN, Cleveland, Ohio.

ASSOCIATES.

HARRY L. HAAS, School of Mines, New York City.
ANTON FERNEKES, " " "
JOHN BRITTON CAULDWELL, School of Mines, New York City.
WM. WALTER SHOTWELL, " " "
ROBERT WILLIAM HALL, " " "
CHARLES RAMSEY BUCKLEY, " " "
A. CASS CANFIELD, " " "
HENRY FRANCIS MOREWOOD, " " "
A. T. COLLINS, 417 Pine street, St. Louis, Mo.
JAMES F. RHODES, Cleveland, Ohio.
OROSCO C. WOOLSON, Chicopee, Mass.
WM. BURNHAM, 218 South 4th street, Philadelphia.
JEROME KEELEY, 432 Market street, Philadelphia.
H. L. THAYER, Denver, Colorado.

SECOND SESSION—WEDNESDAY MORNING.

Mr. E. B. COXE made a statement on behalf of the Centennial Committee of the Institute, of the work which had been accomplished, and of the plans in view for the convenience and comfort of members, and of foreign engineers during the Centennial. About $3,800 had already been subscribed, but $1,200 more would, probably, be needed to enable the Committee to carry out all its plans. The assistance and co-operation of many of the State Governments and large railway corporations had been obtained in providing reports, maps, etc.

The discussion of Prof. HOLLEY's paper, of the evening previous, was then resumed, in which Prof. R. H. THURSTON, E. B. COXE, and O. J. HEINRICH participated.

Dr. T. STERRY HUNT then read a paper on the Cornwall Iron Ore Deposits of Pennsylvania, followed by Prof. B. SILLIMAN, on the adjacent copper deposits, and the description of a new muffel furnace for working the so-called "clay" copper ores of this region.

Prof. T. EGLESTON, chairman, presented the following report of the Committee on Refractory Materials: "The Committee has held several sessions, and beg so report that the rapid improvement in metallurgical operations demand the most serious attention being given to the subject of refractory materials, as being, at the same time, one of the most important, and one of the weakest sides of our modern practice of metallurgical engineering. It is of the opinion that this investigation must be made in the direction of artificially prepared materials, rather than the use of natural substances, and thinks that the investigation should be chemical, mechanical and microscopical, the researches to be made both before and after the proposed material has been subjected to high temperatures, under conditions similar to those in which it is to be used; as not only a good material is required, but it is also necessary that every stage of the operation should be carefully conducted (as a materal, otherwise excellent, may fail from defective manufacture). The Committee is of the opinion that the co-operation of all branches of the profession, those who make and those who use the materials, should be solicited. A large part of the investigation would, necessarily, be synthetical in the way of systematic making and testing of mixtures, and, subsequently, the use of laboratory methods to reproduce what has been proved to be good in actual practice. One reason why so little progress has been made in this direction is, that the experiments which have been made, although in many cases both thorough and costly, have been in private interests, and the results have not been made public, leaving, perhaps, the next investigator to go over exactly the same ground without increasing the sum of knowledge already gained on the subject. The Committee intends to propose an organized plan of investigation, the results of which, it hopes, will not only be of general advantage, but also very materially advance private interests. The Committee begs, therefore, to be cotinued to report at a future meeting."

A motion to continue the committee was carried.

Prof. EGLESTON then read a paper on the subject of Refractory Materials.

THIRD SESSION.—WEDNESDAY EVENING.

President HOLLEY reported on behalf of the Council the following resolutions for action of the Institute:

Resolved, That Messrs. E. B. COXE, W. P. SHINN, and A. L. HOLLEY be appointed a committee on excursions and transportation during the Centennial Exhibition,

Resolved, That a committee of three, to consist of Messrs. R. W. RAYMOND, A. L. HOLLEY, and E. B. COXE, be appointed to confer with a similar committee of the American Society of Civil Engineers to prepare proper presentation of the subject of Technical Education for discussion at the June meeting.

On motion the resolutions were unanimously adopted.

Mr. OSWALD J. HEINRICH read a paper on The Midlothian Colliery in 1876.

Dr. HENRY WURTZ read a paper on Geometrical Chemistry, which was introduced by a few prefatory remarks by Dr. T. STERRY HUNT.

Mr. H. S. DRINKER, of Philadelphia, made some remarks on a work on Modern Tunneling, which he had in preparation and for which he desired to ask the co-operation of his fellow-members.

Mr. DRINKER said that since the presentation of his paper on the Musconetcong Tunnel at the New Haven meeting, in February, 1875, he had been actively engaged in the collection of data, for a general work on Modern European and American Tunneling, describing the various methods of soft and hard ground driving in vogue abroad and in this country. The portion of the work treating especially of the English, Belgian or French, German, Austrian, etc., systems of excavating, timbering, and arching, with a resume of the history of European drilling machinery, was being prepared by contributing engineers in Europe; that valuable contributions had been, and were continually being received from many American Engineers, having experience in Tunneling, embodying a record of direct practical interest.

It was proposed in addition to a general description of methods of work, to supplement each department with tabulated lists, showing the location, cost, rate of driving, cross-section adopted, material passed through, etc., of all tunnels, of which any record however small, could be obtained.

Mr. Drinker concluded by presenting to those present a list of questions which he proposed circulating among the members of the Institute, requesting their assistance in the collection of data.

Dr. R. W. RAYMOND, of New York, spoke of the great practical benefit to be derived by engineers from the work of Mr. DRINKER. He had already palaced at Mr. DRINKER's disposal all the materials and references at his command, and hoped others would do likewise. Mr. E. B. COXE and R. P. ROTHWELL expressed the gratification they felt that Mr. DRINKER had taken upon himself the task of collecting all the facts on American Tunneling, and hoped he would receive the hearty co-operation of individual members of the Institute. President HOLLEY also commended Mr. DRINKER's scheme, and believed the work would be of great value to engineers.

FOURTH SESSION.—THURSDAY MORNING.

A preliminary session was held at 9 A. M., at which Dr. WURTZ continued his paper on Geometrical Chemistry. The regular session was opened by a paper by Prof. FRED. PRIME, Jr., on "What Steel is." A paper on the Effect of Manganese on Bessemer Metal, by Dr. A. WENDEL, of Troy, was read by Mr. R. W. HUNT.

Prof. W. P. BLAKE read a paper on the Manufacture of Ferro-Manganese in Austria, which was followed by a paper by W. P. WARD, of Centersville, Georgia (read by Mr. EILERS) on the Manufacture of Ferro-Manganese in Georgia.

Prof. EGLESTON gave a description of Canfield's Mineral Dresser.

Mr. GEORGE ASMUS read a paper on Alchemy, the Foundation of Chemistry.

Mr. E. B. COXE gave notice, in accordance with the rules, that he intended to propose an amendment to the Rules at the next annual meeting to increase the number of Vice Presidents to nine and of the Managers to fifteen.

Mr. E. C. PECHIN gave notice that he intended to move at the next annual meeting that the name of the Institute be changed to The American Institute of Mining and Metallurgy.

FIFTH SESSION, Thursday Afternoon.

Mr. P. H. DUDLEY read a paper on the Dynagraph. Great interest was manifested by the members in Mr. DUDLEY's methods and results, and the following resolution, offered by Prof. J. LAWRENCE SMITH, was unanimously adopted.

Resolved, That a committee be appointed with Prof. THURSTON as chairman, to adopt efficient means to make the results of Mr. P. H. DUDLEY's experiments beneficial to the railroad transportation of the country. The President appointed, at a subsequent meeting, Prof. THURSTON, P. H. DUDLEY and W. P. SHINN.

Prof. P. FRAZER, Jr., read a paper on the Lithology of the Paleozoic and Mesozoic Rocks of Pennsylvania.

Prof. ARCHER, President of the Royal Museum of Science and Art at Edinburgh, and Chief of the British Centennial Commission, was introduced to the Institute and made a few remarks.

President HOLLEY exhibited a section of Woodbridge gun, showing the manner in which the iron wires are soldered by means of bronze.

Mr. T. F. WITHERBEE read a paper on the Cedar Point Furnace, Lake Champlain.

Dr. R. W. RAYMOND read a paper on the Spathic Iron Ores of the North River.

SIXTH SESSION—FRIDAY MORNING.

Mr. P. H. DUDLEY read a paper on The Analysis of Locomotive Gases. On recommendation of Council the status of Mr. S. HOWLAND RUSSELL and J. K. REES was changed from associate to member.

President HOLLEY reported on behalf of the Council the following resolution for action of the Institute:

Resolved, That Messrs. R. W. RAYMOND, E. B. COXE, A. L. HOLLEY, T. STERRY HUNT and T. M. DROWN be appointed a committee to procure the preparation of papers by the members of the Institute, with special reference to the progress and state of m ning and metallurgical engineering in America and also in foreign countries, in so far as represented at the Centennial Exhibition, said papers to be published in the Transactions of the Institute and to be edited by the committee within one year after the close the Exhibition, for publication as a Centennial Memorial of Engineering.

On motion, the resolutions were unanimously adopted.

Mr. MARTIN CORYELL read a paper on the Diatomaceous Sands of Richmond, Virginia, followed by Mr. JOHN BIRKINBINE on Suspended Hot-Blast Pipes.

Prof. EGLESTON, as Chairman of the Committee appointed to co-operate with the U. S. Test Board, made the following report:

"The Committee, appointed to co-operate with the U. S. Board for Testing Iron and Steel and other Metals, beg to report that they have communicated with the U. S. Board and that their services have been accepted with thanks. They have examined the plans proposed by the U. S. Board, and find them eminently judicious and likely to lead to the most important results in both metallurgical and civil engineering and the science of construction, and that they are likely to be of the greatest possible advantage to the U. S. Government itself, by furnishing results which will both lessen the expense and increase the safety of the naval, war, and civil structures, which the government has to undertake. They therefore beg to present to the Institute the following preamble and resolutions as one of the means of co-operation which will be likely to aid the labors of the U. S. Board." T. EGLESTON, Chairman.

Whereas the committee appointed by the American Institute of Mining Engineers to co-operate with the U. S. Board for Testing Iron and Steel and other Metals has inquired into the plans proposed, and informed itself of the work already done by the U. S. Board, and has reported that the Board is, in its opinion, judiciously organized, and that the plans show evidence of the highest professional ability; and finds that the Board has already employed a competent chemist, and equipped a chemical laboratory where important results have already been arrived at; that a very complete testing machine has been nearly completed under its direction, which is a model both in design and workmanship; that it has already made a large number of experiments with the machines for testing now in use, and collected a large amount of information relating to tests made by different departments of the U. S. Government and other competent bodies and persons; that it has prepared for a complete series of chemical and physical tests of iron and steel and of a number of alloys, which can but result in greater economy and durability of construction; that the members of the Board, who are men of the greatest professional ability and command the public confidence, are contributing their services gratuitously; that the results to be attained are likely, not only to benefit the world at large but also to be of particular advantage to the U. S. Government, by increasing the durability of the material which it is obliged to use, and cheapening the cost of construction of its naval, war, light-house, and other structures; therefore

Resolved, That this Institute heartily endorses the work of the U. S. Board.

Resolved, That it is the opinion of this body that the U. S. Board for testing Iron and Steel and other Metals should be continued.

Resolved, That the Institute respectfully petitions the Honorable Senate and House of Representatives to grant to the U. S. Board the sum of Fifty Thousand Dollars to be expended in carrying out its plans.

Resolved, That this Institute believes that such an appropriation would be judiciously expended, and thinks it would be a *real* economy on the part of the U. S. Government to make the expenditure.

Mr. COXE moved that the report be accepted, and that the Council attend to having the memorial properly engrossed and presented to Congress—Carried.

Prof. THURSTON briefly explained, as one of the members of the Board, the nature of the work they had already accomplished and what they hoped to do. He thought the moral support of such bodies of scientific men as the Institute of Mining Engineers and the Society of Civil Engineers would aid them greatly in carrying out their work.

Mr. R. W. HUNT then read a paper on The New Worthington Compound-Duplex Pressure Pump at the Troy Bessemer works.

President HOLLEY exhibited a New Suspended Water-Cooled Furnace Roof designed by him for the Pernot Furnace.

The following papers were then read by title:

On the Percentage of Iron in Certain Ores, by Prof. A. H. CHESTER, Clinton, N. Y.

On the Origin of Mineral Veins, by Col. CHAS. WHITTLESEY, Cleveland, Ohio.

On Brückner Cylinders, by N. H. CONE, Nederland, Colorado.

Condition of the Mining and Smelting Industry of the Far West at the Close of 1875, by A. EILERS, of New York.

Assay Offices and Mints of Europe, by P. De P. RICKETS, New York City.

Electro Metallurgy, by U. S KEITH, New York City.

Endurance of Iron Rails, by W. E. C. COXE, Reading, Pa.

Blast-Furnace Practice, by J. A. CHURCH, New York City.

The Brown Coals of Utah and Adjoining Territies, by HENRY ENGELMANN, La Salle, Ill.

Determination of Phosphorus in Iron and Steel, by ANDREW A. BLAIR, Watertown Arsenal, Mass.

Mr. F. FIRMSTONE offered the following resolution, which was unanimously adopted:

Resolved, That the thanks of the Institute are due to the officers of the Smithsonian Institution for their courtesy in the reception of its members and providing facilities for its sessions; and to the venerable Secretary for his hearty welcoming address and his kind hospitality; to Hon. A. S. HEWITT, our fellow-member, for his enjoyable reception; and to the local committee—and espepecially Capt. C. E. DUTTON—for its admirable arrangements for the convenience and pleasure of the members during the meeting.

SEVENTH SESSION.

The concluding Session was held Friday afternoon, Vice-President COGSWELL presiding. Prof. J. C. SMOCK, of New Brunswick, N. J., read a paper on the Use of the Magnetic Needle, or Dip Compass in Searches for Magnetic Iron Ore.

Dr. HENRY WURTZ read a paper, subject, Preliminary Suggestions on the Molecular Nature of Iron and Steel.

Dr. WURTZ also exhibited samples of iron and wire, which had been made with the use of petroleum as fuel.

The meeting then finally adjourned.

On Thursday evening, the Hon. A. S. HEWITT received the members of the Institute at his house, on K street, and on Friday evening Prof. HENRY received the members at his house at the Smithsonian Institution.

No excursions were formally organized, but opportunity was given Members to visit the Navy Yard and the Naval Observatory, under the courteous guidance of Commander BEARDSLEE and Prof. HOLDEN.

THE attention of Mineralogists and Capitalists—very different classes usually—is invited in our advertising columns to some valuable titanium ore property in Georgia.

A WATER WHEEL LOCOMOTIVE.—A highly original design of a locomotive for specia purposes is reported from California. It is a kind of water engine to travel up stream, the design being to carry supplies up into the mountains by means of the long flumes used to float down lumber. These flumes are abundant in the mountains of California, Nevada, and the Territories. They are miles in length, and are simply huge troughs, into which a stream of water is led, to float the logs from the mountains to the lowlands, where they are cut up into lumber. The hydraulic locomot ve is constructed with four wheels, and is designed to run on a track like the locomotive engine. The track is to be constructed on the top of the sides of the flume, which may be V-shaped or otherwise. The motive power is the water passing through the flume. At either end of the car is a water wheel similar to that of stern wheel steamers. The wheels, like those of an ordinary car in use on our railroads, revolve with the axle. The axle, to which the wheels are attached, is made the shaft for the water wheel, the arms of which, holding the paddles, extend down into the water in the flume. The current of water in the flume furnishes the power to run the car. Of course the car must travel up the flume if it contains sufficient water to turn the paddle wheels. These paddle wheels are so arranged as to be unshipped when it is desired to run down the flume. As all flumes of this character must have a down grade, the hydraulic locomotive is supplied with brakes to regulate the speed on the down trip.—*Scientific Press.*

THE INADEQUATE UNION OF ENGINEERING SCIENCE AND ART.

Address of President A. L. Holley before the American Institute of Mining Engineers, at Washington, D. C., February 22d, 1876.

THE application of scientific methods to the investigation of natural laws and to the conduct of the useful arts which are founded upon them, is year by year mitigating the asperity and enlarging the outcome of human endeavor. More notably, perhaps, are these the facts in that system of productive and constructive arts of which Engineering is the general name. In metallurgical engineering especially, within the period of our own recollection, how rapid has been the rate and how wide the scope of progress—the scientific discovery and mining of metalliferous veins; the economical separation and reduction of ores of every grade; the production and regulation of high temperatures; the varied improvements in the manufacture of iron, in saved heat and work, in uniformity and range of products; and most important of all, the creation and the utilization, to be counted by the million tons a year, of the cheap constructive steels.

Wonderful as this range and degree of development may appear to the public eye, the close and thoughtful observer must nevertheless conclude that neither the profession nor the craft of engineering may congratulate themselves too complaisantly, but that they should rather acknowledge to each other the embarrassing incompleteness of the union between Engineering Science and Art.

There is a small but most truly scientific and most truly practical school of philosophers whom we may designate as original investigators—men who come close to nature, who search into first principles, and who follow in all things that scientific, and therefore fruitful, method by which the relations of matter and force are discovered, classified, and brought within the reach of practice. These wonderful men do not indeed create the laws of nature, as they sometimes almost seem to, but they go up into the trembling mountain and the thick darkness, and bring down the tables upon which they are written.

There is a large class of men whom we may designate as the schoolmen, a class popularly, and, to a great extent, correctly recognized as the scientific element of human progress; men who are learned in the researches and conclusions of others, and skilled in reasoning or speculating from these or from abstract data upon the certain or probable results of physical and chemical combinations.

And there is the great army of practicians, almost infinite in its degrees of quality, ranging from the mere human mechanism by which mind lays hold of matter and force, through all the grades of practical judgment and power—an indispensable link between nature's forces, as the philosopher thinks they are, and nature's materials, as the practician knows they are.

As the art precedes the science (however the science may afterwards revolutionize the art), let us first consider the matter from the artizan's—the "practical" man's standpoint. While every day's experience could teach him a more helpful lesson, it could hardly teach him one of greater general importance than that the men who speculate, from second-hand data, upon the probable results of combinations of forces and materials, are not the men who can best make these combinations in practice, who intuitively know all the concealed pitfalls, such as friction—that trick of nature, which, like the thousandth part of phosphorus, alters all the conditions of use in iron—nor are they the men who can determine the completeness of these combinations, or read the record of their results, as in the character of a flame, in the feeling of a refractory mixture, in the behavior of a metal under treatment; nor are they the men who, by familiarity with objects and phenomena, are best fitted to pursue that original investigation which is the foundation of even theoretical progress. The expert who delights to call himself "practical," is honestly amazed at the attempts of experts of school graduation who have not been graduated in works, to solve the engineering problems of the day. And from his stand-point there are numerous and conspicuous illustrations. While metallurgists are still disputing over the nature and sequence of reactions in combustion and reduction, the practical iron-smelter has felt his way from the barbarous practice of a century ago, to the vast and economical production of to-day. The attainment of powerful and sufficiently hot-blast by means of waste heat, the adaptation of shape and proportion of stack to different fuels and ores, labor-saving appliances and arrangements—all these have grown out of the constant handling, not of books, but of furnaces.

Proceeding upon a chemical knowledge little superior to that of the average school-boy, BESSEMER developed his revolutionary process. Not knowing for years that the combustion of silicon or of manganese are the chief sources of the necessary heat, ignoring the fact that not alone the reaction but the presence of manganese is a cause of soundness and malleability in steel, magnifying the hypothesis that silicon should promote soundness, instructing his licensees to avoid all irons containing above 0·02 per cent. of phosphorus, and sharing the ignorance of the whole metallurgical profession as to the sequence of reactions in the converter, and the probability of changing their character, BESSEMER and his followers, during the first 15 years of their practice, nevertheless brought this difficult art, which the metallurgical schools call a chemical art, to a high degree of commercial success, and this in the absence of any metallurgical change or chemical improvement whatever, in the treatment of the metal. During all this time, there was almost no literature of the BESSEMER manufacture, and no instructor save that grim sphynx the converter, and the well-nigh inscrutable process. It was a hand-to-hand fight, involving mechanical details, refractory linings, celerity of operations, regularity of melting and conversion, and economy of labor. With every fact written in his book, the closeted scientist could no more adequately prescribe the practical conditions of improvement, than could the student in optics specify in words and formulæ the glory of an Italian sunset.

Here is a cupola-furnace, an old and exceedingly simple device; but one may know all the laws of combustion and fluxing that are written in the encyclopedias, and yet fail to change its working at will, or fail to detect the coming change, until by long familiarity the phenomena reveal themselves as it were instinctively. One may have learned every law of the reactions of oxides and fluxes upon a refractory material, yet until his practiced hand and eye and ear can nicely detect its physical qualities and measure the results of new ingredients and temperatures, he may wander for years in a maze of uncertainties. Notwithstanding all our previous knowledge about the inevitable combustion of carbon and oxygen in the presence of heat enough to ignite them, the Siemens-Martin process, both in its calorific and in its metallurgical aspects, was as purely unpractical as the direct utilization of sun-heat is to-day, until after years of patient observation, not chiefly by scientists, but by men unacquainted with books, and knowing nothing at second-hand, innumerable small increments of improvement at last produced a sufficient temperature in a durable furnace.

In the development of machinery, the same history is repeated. The proportions of parts, in fact, the modern formulæ themselves are derived from the study of innumerable experiments. The adaptation of machinery can only be perfected by him who, as it were, enters into it, making it an incarnation of himself. This enlargement of a man's organism is most strikingly illustrated in the locomotive. OLIVER WENDELL HOLMES has happily described this putting of his life into his "shell" boat, his every volition extending as perfectly into his oars as if his spinal cord ran down the center of its keel, and the nerves of his arms tingling in the oar-blades. The thoughtful locomotive driver is clothed upon, not with the mere machinery of a larger organism, but with all the attributes of a *power* superior to his own, except volition. Every faculty is stimulated and every sense exalted. An unusual sound amid the roaring exhaust and the clattering wheels, tells him instantly the place and degree of danger, as would a pain in his own flesh. The consciousness of a certain jarring of the foot-plate, a chattering of a valve stem, a halt in the exhaust, a peculiar smell of burning, a sudden pounding of the piston, an ominous wheeze of the blast, a hissing of a water-gauge—warning him respectively of a broken spring-hanger, a cutting valve, a slipped eccentric, a hot journal, the priming of the boiler, high water, low water or failing steam—these sensations, as it were, of his outer body, become so intermingled with the sensations of his inner body, that this wheeled and fire-feeding man feels rather than perceives the varying stresses upon his mighty organism.

Mere familiarity with steam-engines is not, indeed, a *cause* of improved steam-engineering, but it is a *condition*. The mechanical laws of heat were not developed in an engine house, yet without the mechanism which the knowledge derived *through this familiarity* has created and adapted, the study of heat would have been an ornamental rather than a useful pursuit. So in other departments:—When one can feel the completion of a Bessemer "blow" without looking at the flame, or number the remaining minutes of a Martin steel charge from the bubbling of the bath, or foretell the changes in the working of a blast-furnace by watching the colors and structure of the slag, or note the carburization of steel by examining its fracture, or say what an ore will yield from its appearance and weight in the hand, or predict the lifetime of a machine by feeling its pulse; when one in any art can make a diagnosis by looking the patient in the face rather than by reading about similar cases in a book, then only may he hope to practically apply such improvements as theory may suggest, or to lead in those original investigations upon which successful theories shall be founded.

These are the conclusions of the "practical" man, and they are none the less true because they are not the whole truth. That they are too little considered by the schoolmen and the graduates of schools is also true, but, happily, less conspicuously so as the years advance.

The evil consequences of this mistake develop themselves in various ways. The recent graduates of schools do not, indeed, expect immediate positions of responsibility and authority, but they often demand them after too short a term of object-teaching. Perhaps the greatest advantage of their scientific training is that they can learn from objects and phenomena faster than can the mere workman, who, although full of the elements of new and useful conclusions, lacks, if I may so say, the scientific reagent which precipitates the rubbish and leaves a clear solution of the problem. It is, however, true—in the iron manufacture, perhaps, especially true—that men of wide learning and of great mental dexterity, unless they have studied at least as many years in the works, as they have in the school, do not successfully compete for the desirable places, with the men that have come up from the ranks. Narrow, unsystematic, and fruitless of new results as his knowledge may be, he who has grown up steadily from the position even of puddler's helper, will be selected to take the manager's post in preference to him whose reputation is founded solely on the school.

Nor does this prove, as the school-men too often believe, that the owners and directors of metallurgical enterprises are always unappreciative of scientific culture. It rather proves that the lowest functions, as in the case of poor humanity, must first be considered—that the conditions of maintenance and regular working, which constant familiarity with objects and phenomena alone can provide, are earliest in order. Conservation first and improvement afterwards.

Another consideration in this connection, is that scientific aid appears to be more readily provided for the "practical" man, than practical aid for the "scientific" man. The trained scholar can the more readily adapt himself to the situation. He should suggest many more improvements than would ever crystallize in an equally good, but undisciplined mind. Yet his attempt, with mere scholastic aids, to carry these improvements out, might disorganize a whole establishment. As there must be one final authority, judgment founded on experience almost universally ranks the wider and more fruitful culture of the school. And if we ask those great masters whose experimental knowledge is as wide as their scientific culture, they will tell us, that as the inert and clumsy fly-wheel, that typical conservator, is more helpful to a steam-engine in the long run, than a valve-gear so highly organized that it seems to know what it ought to do—so in their own undertakings, plodding, practical economics must sit in judgment upon Theory and limit the reaches of Imagination.

Another evil growing out of the inadequate regard of mere schoolmen for practice, is the frequent failure of their works or their inability to complete them. Inventions and constructions designed after a scientific method and under the light of organized facts and detailed history as laid down in books, may fail simply in default of a practical knowledge of how far the capital at hand will reach, or what the means at hand will do, or what the materials at hand will stand, or what the labor and assistance at hand can be relied on to accomplish. A vast number of facts about the operation of forces in materials are so subtle, or so incompletely revealed or disentangled from groups of phenomena, that they cannot be defined in words, nor understood if they could be formulated. But after long familiarity with the general behavior of materials under stress, a practical expert can, by a process more like instinct than reason, judge how far and in what directions he may safely push his new combinations. Thus while the unschooled practician so usually wastes his energies in unscientific methods and on impossible combinations, but generally carries into successful use his comparatively few well-founded attempts, the student merely of principles and abstract facts so usually originates the ideas upon which progress is founded, and so rarely clothes them with practical bodies. In this chasm between science and art, how much effort and treasure, and even life, are swallowed up year by year.

These are not theoretical considerations. The blast-furnace, the converter and the open-hearth have already been referred to; let us observe some other illustrations. A bridge-builder will tell us that few structures in his department of engineering fail, by reason of mistakes in calculating the strain-sheet, but that the majority of failures arise from vibrations, buckling, rapid wear of

important parts, shapes that weaken the material inequalities in the material, and similar causes which are not stated in books, which assume different aspects under every change of proportions and dimensions, and which can only be inferred by means of a long familiarity with the behavior of similar structures during varying periods of service, and with the processes by which materials and members are fabricated. The builder of a machine like a marine-engine, or a locomotive, or a roll-train, or a steam-hammer will tell us that, in designing new adaptations, after every stress that can be distinctly analyzed is provided for, mass to resist vibration, changes of shape to insure sound casting, and various modifications which cannot be formulated for the want of even approximately complete knowledge of their conditions, must still be supplied, simply by judgment founded on long observation of phenomena under similar conditions. And he will thus explain nine-tenths of the failures. Who can imagine the volume of a book, or of an author which should adequately teach the principles of construction as affected by the chiefest of all practical considerations—the economics of the foundry, the forge, and the machine-shop? With the tools and facilities at hand, what divisions of a particular structure, what shapes and sizes and methods of joining can be made cheaply as well as strong and efficient, in all the infinite forms of mechanism? Obtaining such facts from any other source than personal practice, would be like an oarsman studying a book to know when and how in the race he must husband his power, or like a wrestler looking out in a cyclopedia the probable feints of his antagonist.

The successful constructor will assure us that no possible training in the school nor any genius in invention can build economically without such a knowledge of the shop as the athlete has of the possibilities of muscular strength and agility.

These arts have been selected as examples, not because they chiefly depend on skill, but because they so largely involve the highest, formulated mathematical knowledge. How much more important, then, is practical training in those departments where physical laws are very incompletely understood and formulated. How far short of practical success will abstract science stop in sinking pneumatic piles through wrecks and boulders, in tunneling rocks traversed by subterranean streams and beds of quicksand, in cheaply applying hoisting, ventilating, and draining machinery to mines where the scene and conditions of operation are constantly shifting, in firmly founding heavy and vibrating machinery on treacherous ground, in handling and casting melted steel, in constructing refractory metallurgical vessels, in delivering bars red hot and crooked in infinite directions to a roll train, in fabricating durable breech-loading cannon, in building boilers that shall provide for vaporization, circulation, separation, cleaning, and durability, in designing enginery like the horse-shoe machine to shape metals, in proportioning gas-furnaces, in submarine warfare, in aerial navigation, in machine tools, in traction engines, in scaffolding and erection, in railway running gear, in forming artificial stone under water, in permanent-way, in coal cutting, in dredging machinery, in moulding and casting, in brick machinery, in tube-drawing, in coal-burning, in pavements? Limited or impossible as would be the progress of engineering arts in the absence of that knowledge and those methods which are imparted in schools, delay and failure would hardly be less conspicuous if the schoolmen should stay in the schools and thence attempt the application of abstract science, or expect mere workmen to apply it by hearkening to their directions.

I hope it may not seem that the dignity of abstract scientific investigation is undervalued by the utilizers of nature's powers and materials, or that any considerations of profit obscure even in the average commercial mind, the splendor of those achievements made in the mere love of truth, with thought of neither commercial application nor pecuniary reward—achievements which distinguish such names as FARADAY, BUNSEN, LEVERRIER, MAYER, JOULE, HENRY, DARWIN, and TYNDALL. Do not their successes rather encourage us, in our lower sphere, to more persistently pursue the method of these great discoverers—the original investigation of Nature's truths? Not less literally than in the poet's fancy,

> "To him who in the love of Nature holds
> Communion with her visible forms, she speaks
> A various language."

To the skilled artizan she reveals herself as truly, though not as widely, as to the Philosopher. In the aphorism of GOETHE,

> "Mankind dwell in her and she in them.
> With all men she plays a game for
> Love, and rejoices the more they win."

But the undervaluation of the study of objects and phenomena by schoolmen, is not the principal hindrance to the complete union of science and art. A greater obstacle is the combined misapprehension and ignorance on the part of a large class of "practical" men, of what they are pleased to call "theory," meaning by theory, something which is likely to be discordant with fact—or possibly with the interests of the craft. We can hardly complain that their objection is ill-grounded, in so far as it is grounded upon the practice of theoretical men, but the world has a right to complain of their narrowness of observation, of their stolid incomprehension of the results of science, of that pride of ignorance, of that bigotry, of that positive fear of the diffusion of knowledge, the normal condition of those who range only within the sphere of their own practice, and to whom analysis and generalization, in their business affairs, as well as in morals and politics, are an unknown thing. It is unfortunately true that a large number of managers in metallurgical enterprises—men who are deemed indispensable, and who, probably, *are* indispensable, in the average state of practical science, are thus not incorrectly characterized. Conscious of their power as conservators, ignorant of the elements of improvement, and not unfrequently jealous and blindly fearful for the interests of their craft, they sit triumphant on an eminence (the steady undermining of which they cannot observe), and sneer at the too frequently condescending magniloquence of recent graduates and book men. The best of this class are the workful and painstaking men who come up from the ranks—men who are plucky in emergencies and regulative of labor—men whose unconscious reasoning or intuition covers the ordinary exigencies, and who, perhaps for this very reason, never inform themselves outside of their own range of observation, nor observe in a methodical or fruitful manner.

There is also a class of practicians who do secretly and abstractly respect the labors of the scientific investigator, and are unwillingly governed, more or less, by his conclusions; but their minds are so barren of general facts and so untrained in the scientific methods of utilizing facts, and, hence, so distrustful of any ideas which reach beyond their own practice, that they, also, are impediments rather than helpers in the union of Science and Art.

It is often said, I am aware, that there is never any real antagonism between Science and Art, and that all men respect, even if they do not promote, the efforts of both scientists and practicians, to forward the useful arts. What then shall we say of that phase of trades-unionism, which not only tends to repress improvement but which, often, violently defeats the works of progressive thinkers, and sometimes destroys their authors? Let us also observe an extreme, but not isolated, case of the executive treatment of science. Long before the professional career of most of us began, the Erie Railway Company commenced a series of experiments in civil and mechanical engineering, sometimes elaborate, like those of ZERAH COLBURN on traction, and always useful; many of them incorporated with and improving the practice of the road for a quarter of a century. The voluminous drawings and records of this experimental practice, always preserved by the engineers of the road, were just beginning to be remembered by young and inquiring engineers, as a mine of professional information, when it was discovered—you will hardly believe me—that the engineer of the Erie road having been turned out, the whole of this priceless accumulation of reports and drawings was dragged off by the cartload to a paper mill, and destroyed, by JAMES FISK, JR. In reviewing the railway history of the country, many of you will remember that this act of vandalism has been by no means the worst blow which engineering has received from so-called "practical" men.

I have referred to these exceptional cases, merely to correct a modern idea that engineering progress, especially by scientific methods, is, as yet, the creature of popular favor. It is refreshing to turn from such considerations to the still exceptional but happily growing appreciation and helpful respect of practitioners and scientists for each other, as sometimes exemplified in the various departments of mining engineering. When we see recent graduates patiently leading the untrained, confused, but determined mind of the workman, painfully wrestling with hard names and occult processes, into methodical habits of thought and the rudiments of organized knowledge; when we see the grimy workman, not standing aloof for fear of his craft or of his trades-master, but dragging the recent graduate into mines and furnaces, and patiently teaching him how to recognize that matter, in mass and under mighty forces, which he had heretofore contemplated in cabinet specimens, and chiefly in ideas; when we see the commercial manager of metallurgical enterprises opening his works to the graduates of schools, and giving them a chance, not only to complete their education, but, by judicious application of their efforts, to earn a living, meanwhile; when we see such things, as happily we may, here and there in metallurgical works, we may assure ourselves that *one* way has been discovered to promote the union of Science and Art.

In the enlargement of this method of mutual respect and instruction, to a certain extent, lies the solution of the problem under consideration; but it is a complex method, only actively operative under several important conditions, such as:

1st. A *public opinion* among schoolmen that a course of object and phenomena study in works is not to be reckoned a matter of mere business sequence, but a large and equal feature of that curriculum which is essential to a degree of professional graduation.

2d. A diffusion, among the class which we have termed the "practical" class, of a real appreciation of an organized system of information and of the scientific method of making this information useful to all classes of men, and noxious or unimportant to none; such a general explanation to that vast, preponderating class of workmen, and of foremen and managers, who are foremen and managers, simply, because they have been efficient workmen, as will ever prevent their indiscriminate and contemptuous application of the term "theory" to whatever a schoolman proposes.

3d. An understanding among the owners, directors, and commercial managers of engineering enterprises, that it is not a matter of favor, but a matter of as much interest to themselves as to any class; that young men of suitable ability, and of suitable preliminary culture, however acquired, should have opportunity and encouragement to master the practical feature of technical education in works, not as mere apprentices, but under reasonable facilities for economy of time and completeness of research.

But these conditions do not largely exist, and are only growing with general civilization. They must be hastened and magnified by some better means than merely stating the case again and again, as some of us, I confess, are too fond of doing; than perpetually repeating, in a manner more sentimental than efficient, that scientists should appreciate practice, and practicians should appreciate science, and capital should join the hands of science and practice, saying, "Bless you, my children," in the expectation that this will prove a fruitful union. Let us rather inquire if some new order of procedure in *technical education*, some revolutionary innovation, if need be, will not put the coming race of engineers on a plane which is lifted above the embarrassments from which we are slowly emerging.

1st. In order that the technical school should be in the highest degree useful, fruitful, and economical, it must instruct not *men* of good general education, but *artizans* of good general education. The art must precede the science. The man must first feel the necessity, and know the directions of a larger knowledge, and then he will master it through and through. Mark how rapidly the more capable and ambitious of practical men advance in knowledge derivable from books, as compared with the progress of bookmen either in books or in practice. Many men have acquired a more useful knowledge of chemistry, in the spare evenings of a year, than the average graduate has compassed during his whole course. These men realized that success was hanging on their better knowledge. Familiar with every changing look of objects and phenomena, they detected the constant play of the unknown forces which underlie them, and longed for a guide to their operation, as a mariner longs for a beacon light. Their practical familiarity and judgment at once revealed the importance of scientific facts and methods, promoted their acquisition and guided their application. Under what comparative facilities does the mere recitation-room student, or even the mere analyst of the hundred bottles, study applied chemistry. It is to these, a matter of routine duty, without a soul; they are neither stimulated nor directed by a previously created want. Beginning with theoretical and abstract knowledge, is no less an inverted process in the useful arts than in the fine arts—as it would be to take a course of RUSKIN within brick walls, as preparatory to opening a studio, and then climbing the mountains to square nature with the book.

Undoubtedly, there may be extremes in any form of educational method. For a youth to begin the special business of technical education by any method, practical or otherwise, before he has acquired not only a common school education, but, at least, such a knowledge of polite literature and general science, including, of course, mathematics, as would fit him to enter one of the classical universities, should be strongly discouraged, for various reasons. It is useless to disguise the fact that the want, not of high scholarship, but of liberal and general education, is to-day the greatest of all the embarrassments which the majority of existing engineering experts and managers encounter. This statement cannot be deemed uncomplimentary to the class, seeing that they have

risen to power despite the embarrassment. At the present day, the high-school systems founded by States and by private enterprise, bring such an education within the reach of every one; and it seems of the first importance to promote, if not almost to create, a public opinion that liberal and general culture is as high an element of success in engineering, as it is in any profession or calling.

But this is not all. Professional and business success are not, even in America, the chief end of life. All the social and political relations and even personal happiness are governed, not by the specialties, but by the balance of mental culture. What then shall we say of the policy of wealthy parents—not indeed general, but too frequent—of placing an uncultured boy in a technical school, and then in works and business, without giving him one chance to acquire a general and polite culture.

Many young men display a liking, and others a marked talent in some special direction. There is no danger that these will be crowded out of existence by the culture necessary to make a well balanced mind; and the nearer the talent approaches genius, the less imminent will be any such danger.

The proposition then is, not that mere common shool boys shall go into works and then into technical schools, but that young men of more advanced general culture, when they do begin the business of technical education, shall apply to nature first and to the schoolmaster afterwards.

It may be urged in favor of beginning in the technical school rather than in the works, that mental capacity for the after acquisition and application of facts and principles, is thus developed. But mental training is not the product of the technical school alone. Habits of logical thinking and power of analysis and generalization may be acquired in any school. And a positive objection to beginning with the technical school, is that it cannot stop at logical methods and sciences which are essentially abstract. It also attempts to teach about objects and phenomena, the first knowledge of which, if it is to be broad and genuine, must come from the fountain head.

These considerations may be farther illustrated by the course of the inexpert graduate, when he enters works as a matter of business or of study. We have seen that the practical man can, at least, keep the wheels running and the fires burning, and that when he is of a certain grade of ability and ambition, he will most rapidly acquire the scientific knowledge and culture, which, joined to his practical judgment make him a master. The unpracticed graduate, however, can keep neither wheels turning nor fires burning—he has not even the capacity of a conservator. Nor can he for a long time recognize in the whirl and heat of full sized practice, the course and movement of those forces about which his abstract knowledge may be profound. The youngest apprentices are more useful in an emergency. He must begin with the lowest manual processes, not indeed to become simply dexterous, but, as it were, to learn the alphabet of a new language. He has started in the middle of his course instead of at the beginning. He must go back before he can advance, while the practician goes straight on. The knowledge of the schoolman about physical science, however often he may have visited works and mines and engines, during school excursions, is essentially abstract; it no more stimulates desire and power of practical research, than the calculus creates a passion or a capacity for studying the actual work of steam in an engine, or the actual endurance of a truss in a bridge.

The disappointment of inexpert graduates at finding themselves so far from being experts, their inability ofttimes to pay for farther schooling, the necessity that they should now begin to earn money, as they had persuaded themselves they could so readily do upon graduation, discourage many from pursuing engineering, and what is worse, send many out into practice, who never do complete their technical education, but who, by the character of their work, lower the professional standard.

It can hardly be urged against the precedence of practical culture, that the student will get "out of practice" while he is in the school. He may indeed loose dexterity, but not the better fruits of experience. In fact, those who begin as practicians, almost instinctively keep up their intimacy with the current practice.

A most signal advantage of beginning technical education in the works, is that the mind is brought into early and intimate consideration of those great elements of success which cannot be imparted in any other way—the management of labor and the general principles of economy in construction, maintenance, and working. An early knowledge of these subjects moulds the whole character of subsequent education and practice. There seems to be no corresponding advantage in beginning with the technical school. The fundamental mathematics and general information on physical science may be acquired in the preliminary school.

There is little doubt that the managers of technical schools will favor this order of study. They want to graduate not half educated men, but experts. They desire of all qualifications in the student, that enthusiasm which can only spring from a well-defined want of specific knowledge.

2d, But the *order* of education is not the only desirable change. Whether before or after their course in the school, the hundreds of young men who are every year entering engineering pursuits, are wasting their time in bad methods of practical study, or if after the school course, they are more frequently doing bad work as engineers, when they should still be only students. While the teaching of general facts and principles and of scientific method is highly developed, there is no organized system for guiding students to direct knowledge of objects and phenomena. This statement requires two explanations; I. Apprenticeship is a school of skill in a specialty rather than a school of liberal art. It is intended for a class of men who propose to remain mere workman and not for the class who intend to improve and direct engineering enterprises. It imparts a degree of dexterity far beyond the requirements of the general expert, while it would hardly impart in a lifetime his required range of practical knowledge. II. A school of engineering practice, such as that of research in zoology which was established by AGASSIZ, at Penekeese Island, would be wholly impracticable, because it could be nothing less than a vast and successful establishment for construction and operation in nearly all the departments of engineering. If such a school were not commercially successful, and if its range were not comprehensive, it would be unsuitable and inadequate. Hardly two engineers acquire any part of their practical knowledge in the same curriculum. They pick it up as best they may, usually in a manner that is wasteful of time or damaging to the public.

Now, if there can be a *system* of instruction in the one school, there can be in the other. The same discipline and responsibility, the same guidance as to precedence of study, quality of evidence, and correctness of conclusion should hold good in both cases. To say otherwise would be to say that *all* knowledge should come from unaided original research, and that every investigator should begin, not where a former investigator left off, but where he began. It, therefore, appears that there can be a school of practical engineering, but that it cannot be mere apprenticeship in engineering practice, nor a system of engineering construction and operation, maintained merely for the purposes of a school.

The only alternative is to establish organized schools in the various existing engineering works. At first, this idea would seem subversive of all discipline and economy, but I am assured, by experts in several branches of engineering, that such would not be the case. Let us take, for example, a Bessemer works. A score of students under the discipline, as well as under the technical guidance of a master, could be distributed among its various departments, not only without detriment, but with some immediate advantage to the owner, for while receiving no pay, they would become skillful, at least as soon as the common laborers who form the usual reinforcements. Students should, of course, be expected not to work, when, and in what manner they might choose, but to do good and full work during specific hours. This responsibility, as workmen, would rapidly impart not only the knowledge sought in the works, but a desire for higher knowledge and culture.

These considerations are not merely theoretical. Several students at a time, subjected to no discipline, sometimes working hard, and sometimes not at all, may often be found in a Bessemer works, and I have yet to hear of their embarrassing the management in any way. The laborer has no cause for interference, as the students are not under pay, and whatever they accomplish is clear gain to three parties concerned—the owner, the student, and the operative. A large number of young men may be found studying in machine shops, and sometimes earning small pay, besides having opportunity to work in all departments.

The proposition is to enlarge and systematize the existing desultory study in works—to increase its usefulness to the student, and, at the same time, to make the granting of such facilities to students an object, immediately, as well as remotely, to the owners of works. To this end, the schoolmaster should be not only well read in the professional literature, but a practical expert who could take charge of the works himself, so that whilst best aiding the students, he could prevent their interference with the regular and economical operations. His functions would be, not those of an instructor, nor, to any great extent, of a clinical lecturer, but those of a disciplinarian. The students should acquire skill, in order that they might acquire judgment of skill, and original knowledge of materials and forces, and the master should see that they did acquire them all. He might do some service by stated examination and current criticism and suggestion, but his chief office would be to promote honest work, and to provide opportunity for work in all departments with reference to the economy of the student's time, and the owner's interests.

It should thus appear that these somewhat radical changes in the curriculum of engineering study—first, a hand-to-hand knowledge, acquired not desultorily, but by an organized system, and afterwards the investigation of abstract and general facts, and their relations, would largely economize the student's time, and better the quality of his knowledge. The novice is nearly as valuable a student in works as the graduate, but he is a vastly less apt scholar in the school. My own belief, founded on the study of many typical cases, is, that this order of procedure would produce a better class of experts in little more than half the time required by the reverse order; that it would always make *experts;* that it would discourage none from finishing an engineering education which would be complete in its parts, even if insufficient time were taken to fully develop it. A well-balanced culture will naturally grow in scope and in fruitfulness.

In this connection it seems proper to say a word about the royal road to learning, which a few ill-advised students attempt to pursue. I do not refer to them availing themselves of professional data and drawings on file in engineering offices, but I do refer to their asking engineers and managers to furnish them special reports on subjects regarding which their own observation would be vastly more useful to the applicants, and quite as convenient to the respondents—reports on the number and duties of workmen in each department, and the particulars of operation and relative cost, which can only be profitably investigated by a student, when not only the facts but the reasons are ferreted out by himself, rather than transmitted to the academic grove through the post office.

In conclusion, if it should appear, upon larger observation, to the profession in general, as it does appear to many of its members, that this want of coalescence, ranging from indifference to antagonism between its scientific and practical branches, is a real and substantial fact, a larger effort would, undoubtedly, be made to change a condition so damaging to the profession and to the public. This inappreciation of one department by the other is not unnatural—neither side has taken sufficient pains to observe what the other side has done. The mere scientist instinctively believes that the achievements of the profession are so far due to the deductions of scientists that all other causes fade into insignificance; and the practician knows that just as far as animal life is from the disembodied spirit, so far is utilization of nature from the formulæ of heat, chemical affinity, and mathematics itself.

The first step is to recognize the fact, and I beg engineers, especially those who, from their scholastic habits, see least of the every day embarrassments which are encountered by the executive departments of the profession, to take into account, not only the pride of class power, which the artizan feels as keenly as the scientist, but those baser elements of disunion, ranging from trades-unionism to counting-room dictation in technical affairs.

Having recognized the grave and comprehensive character of the evil, the next step should be, not, I think, to attempt any violent alteration in the existing conduct of engineering by the men who are now in active service, but to change, if I may so say, the environment of the young men who are so soon to take our places, in order that their development may be larger, higher, and in better balance. Two co-operative methods have been suggested—reversing the order of study, and organizing the practical school.

Whatever the course of improvement may be, it becomes us to leave some heritage of unity to the coming race. How shall we more fitly crown a century of engineering—a century in which our noble profession has risen from comparative potentiality to living energy. And as its force is multiplied by the general advance of science, it becomes the momentum which evermore shall actuate the enginery of civilization.

EXTRACTION OF GOLD, SILVER, AND COPPER, AS PRACTISED AT STEWART'S REDUCTION WORKS, GEORGETOWN, COL.

Special Correspondence of the Engineering and Mining Journal.

TO THE EDITOR: SIR—The difficulty experienced in amalgamating the gold and silver contained in certain classes of ores, has led to numberless experiments to find some substitute for amalgamation which would prove a financial as well as a chemical success. Silver ore can easily be chloridized up to ninety or ninety-five per cent., in nearly all of the furnaces in general use. With

many classes of ores, including, perhaps, the majority of those from Clear Creek Co., it is practically impossible to carry the amalgamation further than to within from five to ten per cent. of the chlorination. Amalgamators have come to look upon this loss as inevitable, and think nothing of allowing ore containing from five to ten ounces of soluble silver to pass down the creek. Very little calculation would suffice to show that this loss is highly detrimental to the miner, the mill-owner, and the country at large. Any loss incurred in some of the earlier operations would not be so severely felt, but here we have silver that has gone through almost all the operations necessary to convert it into bullion, which, at the very last stage of the process, is allowed to run to waste. By treating the ore with a solution of calcic hyposulphite, as is now done at the STEWART Reduction Works, all of the soluble silver may be extracted. This, however, is not the only point gained by this process. The first cost of machinery is less than one-half the cost of amalgamating machinery; less power is required to drive it, while the wear and tear will not amount to more than one-fourth. After the ore has been chloridized in the furnaces, it is wheeled into the agitators, which contain about two tons of ore. These agitators are circular vats of wood, nine feet in diameter and four feet in height, in the inside of which revolves an arm or paddle, driven by a bevel gear from the line shaft above. They are also provided with a tight fitting cover, and two pipes with valves at a convenient distance above the cover, the one to regulate the admission of steam and the other, sulphurous anhydride. After the required amount of ore has been wheeled into the agitators, a solution of sodic and ferrous chlorides, $NaCl+FeCl_2+H_2O$, commonly known as HUNT & DOUGLAS liquor, is run into the agitators from the supply tanks, which are located at higher level. The agitators are then covered, the paddle thrown into gear, and sulphurous anhydride SO_2 passed into the agitator through one of the pipes already mentioned, which communicates with a closed retort partly filled with iron pyrites or crude sulphur, and fed by a forced blast of air. Steam is also turned on at the same time, in order to heat the bath as hot as possible. The ferrous chloride dissolves whatever cupric oxide may be present in the ore. If sulphurous anhydride were not passed into the bath at this stage of the process, ferric chloride would be formed by the contact of the ferrous chloride with oxidizing substances in the ore, and the copper precipitated. In the presence of sodic chloride, cupric chloride converts whatever argentic sulphide may be in the ore to argentic chloride, the reaction being explained by the following equation:

$$2CuCl_2 + Ag_2S + NaCl = 2AgCl + 2CuCl + NaCl + S.$$

After running five hours the paddles are thrown out of gear and the solution allowed to settle. As soon as the liquor becomes clear it is drawn off, and water run into the agitator. Steam is now turned on, and the paddles thrown into gear. After washing with hot water two hours the motion is stopped and the contents allowed to settle. When clear, the water is drawn off and calcic hyposulphite run into the agitators by rubber hose connecting with the supply tanks above. The paddles are once more put into motion, and steam turned on until the solution is heated up to 100° F. The ore is kept in suspension for four hours, and then allowed to settle, and the clear silver solution drawn off. If the ore is rich in precious metals it is again treated with calcic hyposulphite for three hours. The hyposulphite is then drawn off, and the ore treated for one hour with water heated up to 100° F. After settling, the water is drawn off, and the ore washed from the agitator by turning on a stream of water, putting the paddles into motion, and opening a vent in the bottom of the agitator. By this means the agitators can be emptied, cleaned and made ready for a new charge of ore in a few minutes. The HUNT & DOUGLAS liquor, after leaving the agitators, is run through a filter box to remove mechanical impurities, and then passed through a series of small tubs containing scrap iron to precipitate the copper. The precipitation and conversion of the HUNT & DOUGLAS liquor back to its original state will be easily understood from the following:

$$2CuCl + NaCl + Fe = 2Cu + FeCl_2 + NaCl.$$

The liquor is then ready for use again, and is pumped up into the supply tanks from which it was drawn. The wash water is treated in the same manner, evaporated up to standard (15° B.) in copper pans, and pumped up to the supply tanks. The hyposulphite solution with which the silver has been dissolved, after leaving the agitators, passes through filter boxes into large precipitating tanks. The manner in which the solution is affected will be readily understood from the equation below:

$$2AgCl + 3CaS_2O_3 = Ag_2Ca_2S_6O_9 + CaCl_2.$$

The silver is precipitated from the solution by adding calcic sulphite and stirring vigorously for a few minutes, and then allowing the precipitate to settle to the bottom of the tanks. The action of the calcic sulphide is explained by the equation $Ag_2Ca_2S_6O_9 + CaS = Ag_2S + 3CaS_2O_3$.

When the liquor has become clear it is run into a regenerator and sulphurous anhydride passed into it, which converts any excess of calcic sulphide that may have been used in precipitating to calcic hyposulphite, according to the following: $2CaS + 3SO_2 = 2CaS_2O_3 + S$. After leaving the regenerator it is pumped up into the supply tanks to be ready for further use. The water with which the ore was washed, after treatment with the hyposulphite, is precipitated and regenerated in the same manner as the hyposulphite, of which it is a dilute solution, and then evaporated in iron pans up to 8° BAUME, and pumped into the supply tanks. When the precipitate has accumulated in the supply tanks to the depth of five or six inches, it is washed with hot water until all impurities are removed. It is then dried and roasted at a low heat in a small reverberatory furnace until all the sulphur passes off. Fluxing material is then added, if required, and the heat increased until the whole mass becomes fluid. The slag is then drawn off the surface, and the clean metal ladled into molds. The bricks are then ready for shipment.

The slags are assayed, and if they contain more than twenty ounces of silver, are returned to the mill and treated with the ore. At Georgetown, where but a small percentage of the ores contain copper, the chloride of copper is not precipitated from the HUNT & DOUGLAS liquor except when there is an excess. Experience has proved that the treatment of the roasted ore with the HUNT & DOUGLAS bath invariably increases the chlorination from three to eight per cent., while it, together with the washing with hot water which follows it, removes many soluble salts, which otherwise would go into solution with the hyposulphite and be precipitated with the silver. The cost of pulverizing and chloridizing ore is so well known that we will omit it in the following estimate and confine ourselves to the cost of leaching, and reducing the precipitate:

Cost of labor, per ton	$1 87
" " fuel " "	1 13
" " chemicals, per ton	1 60
" " roasting and smelting, per ton	1 20
Total	$5 80

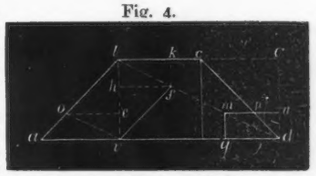
When we consider that from three to ten per cent. more silver can be extracted by this process than amalgamation, its advantages over the latter system become apparent. In treating silver ores, rich in copper, the copper saved would more than pay the entire cost of reduction. The economy of this system of treating ores and its adaptability to those of the most refractory nature will doubtless lead to its extensive introduction in the mining districts of the West. Very respectfully yours, D. W. BRUNTON.

GEORGETOWN, Col., Feb., 1876.

STRAINS IN TRUSSES.

WE regret that, through an oversight, an additional figure was not prepared to accompany Prof. PHILBRICK'S solution of the problem suggested by Mr. TRAUTWINE, and, consequently, his letter was rendered unintelligible. We give, herewith, the solution with the proper diagram, and refer our readers to the ENGINEERING AND MINING JOURNAL of the 19th February for the Professors article in full:

Fig. 4.



"REQUIRED: The strains on the different parts of the truss, Fig. 4, with a weight resting on *b*. Join *bd* and construct the parallelogram *bovf* on *bv* as a diagonal representing the weight. We have *bo* representing the strain on the brace *ba*, and *bf* representing the force in the direction *bd*, which must be transmitted to *d* through *bc* and *cd*. *be* is the portion of the load sustained at *a* and *bh=ev* is the portion sustained at *d*. *oe=hf=bk* is the strain in the tie *ad*. Make *dn=bh* and complete the figure as represented; then *dp* represents the longitudinal or compressive strain in *dc*, and *np* represents the horizontal component of that strain; but *nm=hf*=horizontal force transferred through *bc* and *cd* to the abutment *d*. Therefore, *pm=nm—np*=the shearing stress in *cd*.

Iowa State University. P. H. PHILBRICK.

THE PRODUCTION AND IMPORTATION OF SPELTER IN THE UNITED STATES IN 1875.—Communicated by WM. PAULSEN, No. 10 Burling Slip, New York, Agency of the Stolberg Co. at Aix-la-Chapelle, and of the St. Louis Smelting and Refining Co. at St. Louis.

DOMESTIC PRODUCTION IN GROSS TONS.	1873.	1875.
Matthiessen and Hegeler Zinc Co., La Salle	Nothing.	3,500 tns.
Martindale Zinc Co., St. Louis	1,800	2,200 "
Illinois Zinc Co., Peru, Ill.	900	1,518 "
Lehigh Zinc Co., Bethlehem, Pa.	586	1,505 "
Missouri Zinc Co., St. Louis	1,400	1,500 "
La Salle Zinc Co., La Salle	1,004	1,329 "
Carondelet Zinc Co., St. Louis	537	950 "
Passaic Zinc Works	....	600 "
New Jersey Zinc Co	441	700 "
Chicago Zinc and Mining Co	....	600 "
Bergen Port Zinc Co.	....	500 "
Robert Lanyon & Co., La Salle, Ill.	....	331 "
Production of Scrap and Dross in New York, Philadelphia, and Boston, estimated at	675	600 "
Total	7,343	15,833 "

Importations of Silesian Spelter in 1875	540 tons.
Stock, January 1, 1875	135 "
	675 "
Stock, January 1, 1876	145 "
Deliveries for consumption in 1875	530 "
Average importation, p. a. since 1862	3 403 "

GOLD PRICES OF COMMON SILESIAN ON THE 31ST OF DECEMBER.

	1866.	1867.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.
New York, gold, cents	6½	6⅜	6¼	6 3-16	5⅞	6¼	6⅞	7	6⅞	7 3-16
Ham'g, Banco & Rm'y	14,10	13,12	13,6	13,	11,12	14,14	15,10	26,¼	25	26

NOVA SCOTIAN GOLD STATISTICS.

By A. Heatherington, F.G.S.

(Compiled from Official Records.)

Yield of gold from all sources	oz.	248,072¾	$4,829,149¼*
" " " quartz mines	"	243,467¼	4,739,496¼
" " " alluvial "	"	3,133	60,987
" " " cement "	"	1,472½	28,665¾
1862†–1875.			
Average gold yield, per 2,000 lb., quartz	15 dwts.,	4·87 grs.	= $14·80
" " " man, daily	1 "	22·674 "	= 1·865
Quantity of quartz crushed (tons of 2,000 lb.)			315,025¼
" cement " " "			10,605
Total number of days' labor			2,489,470
Mean number of miners, daily			570
31ST DECEMBER, 1875.			
Number of quartz mills (in partial use only)			17
" stamp-heads in above			192
" mines under exploitation			42
Estimated area " " (acres)			50
" value of plant			$150,000
Greatest depth attained (feet)			560
Extent of auriferous territory, as estimated by the present Director-General of the Geological Survey (square miles)			3,000

HALIFAX. N. S., Feb., 1876.

* At $19·466 per oz. † No reliable data for 1861.

THE PAYTON AND HOLMES COAL-CUTTING MACHINE.

(From Engineering.)

WE illustrate above a machine especially designed for cutting coal, recently perfected by Mr. W. PAYTON and Mr. JOSEPH E. HOLMES, of 41 Borough-road, London, and in which the special characteristic is the method adopted of giving a percussive action to the teeth of the saw by means of short cranks or eccentrics. The construction of this machine, and the manner in which it is worked, will be understood clearly from the drawings, in which Fig. 1 is a plain, Fig. 2 is a longitudinal section taken through the center of the machine, and Fig. 3 is a traverse section.

The frame of the machine A, A^1, A^2 is placed upon the truck B, which is mounted upon wheels B^1, and runs on the pit rails. The parts A A^1, which carry the saw and its mechanism, can be turned upon the lower part A^2 of the frame to permit the angular adjustment of the saw, and the entire frame has a longitudinal movement upon the truck. The saw is shown at *a*; *b* b^1 are the eccentrics for actuating it, driven by the gear-wheels *c*, *d*, *e*; these wheels being mounted on shafts c^1, d^1, e^1, which are supported in bearings c^2, d^2, e^2; *f* worm j^1 is thrown into gear with the rack *h*; the frame A then commences its automatic forward movement on the truck, which causes the saw to advance to its work, while at the same time it is operated by the eccentrics *b* b^1, to give the teeth the peculiar circular motion and percussive action which is indicated by the series of circles a^3 a^4, in Fig. 1. The solid lines a^3 of these circles show the surface of the coal as it is cut by the teeth.

Fig 1

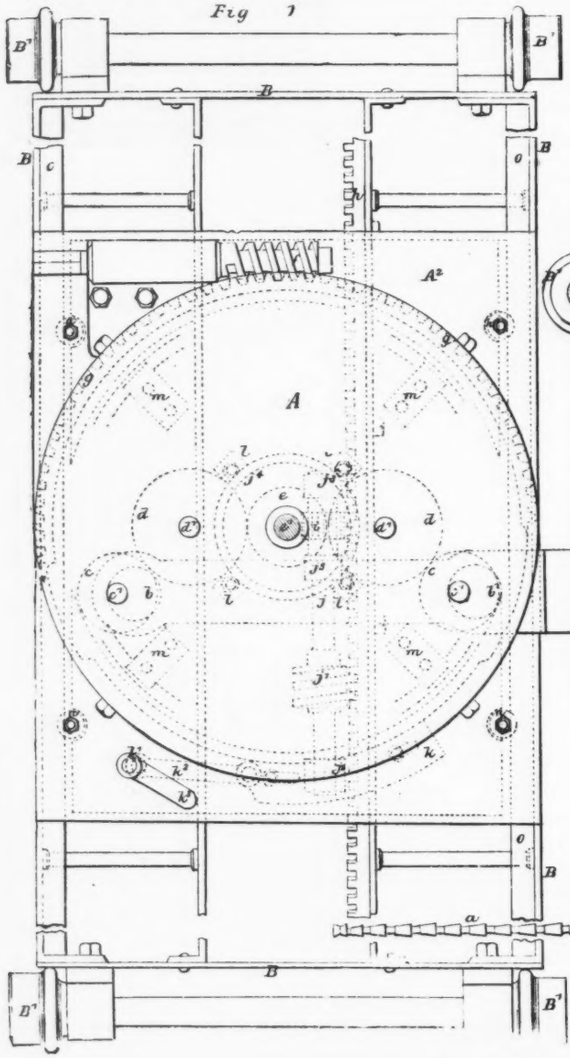
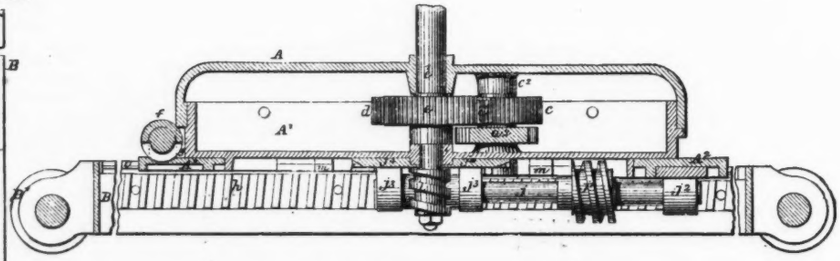


Fig 2



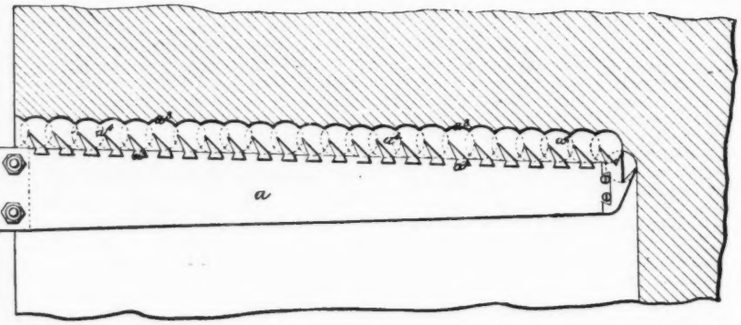
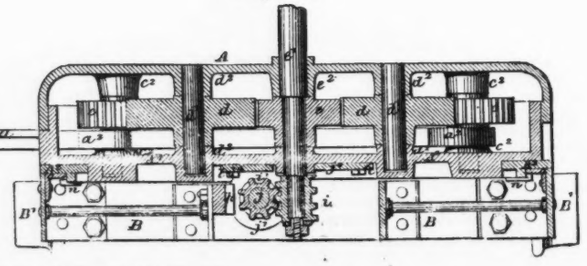


Fig 3



THE PAYTON AND HOLMES COAL-CUTTING MACHINE.

is a worm geared with teeth *g* on the part A^1 of the frame for turning or adjusting it upon the lower part to bring the saw to its work in commencing to cut a seam of coal; *h* is the rack; *i* i^1 are the worm and worm wheel; *j* is the shaft: and j^1 the worm for moving the frame longitudinally upon the truck to cause the saw to advance; *k* is a segment plate attached to the plate A^2, and which carries the bearing j^2 of the shaft *j*; k^1 is an eccentric, k^2 a link, and k^3 a lever, which together form the arrangement for adjusting the segment plate to throw the worm j^1 into and out of gear with the rack *h* to permit the frame to be moved forward to its work or moved back quickly, when the frame has been forced forward by the worm j^1 the full extent of its movement upon the truck; j^3 j^3 are bearings for the shaft *j* secured to a plate j^4, which is capable of turning around the center of the part A^1 of the frame; *l l* are clips for securing the plate j^4 upon the frame while permitting it to turn freely when required; *m m* are plates for holding A^1 in place on A^2 while permitting one part to be turned or adjusted on the other.

In commencing to cut a seam of coal the truck is secured by blocking the wheels on the rails, and the frame is made fast on the truck by tightening the nut of one of the bolts *n*, the saw then lying with its teeth parallel with the face of the seam of coal to be cut. The saw is then started, and at the same time the worm *f* turns the frame upon the truck, so that the saw works its way into the seam, cutting a groove in it from the face of the seam inward till it reaches the position shown in Fig. 1. The worm *f* is then thrown out of gear, the nut of the bolt *n* is slackened to set the frame free upon the truck; the

THE QUICKSILVER FURNACE LITIGATION.

A SUIT was instituted in the United States Circuit Court, about 18 months ago by R. F. KNOX and JOSEPH OSBORN against the Great Western Quicksilver Mining Company, for infringement of certain patents issued to them for improvements in roasting furnaces for the reduction of cinnabar.

The Great Western Quicksilver Mining Company built their first furnace in the winter of 1873-4, and commenced reducing cinnabar in the spring of 1874. This furnace was claimed to be an infringement of their patents by the plaintiffs, but not admitted by the defendants. Issue was joined and the trial began in this city on the 21st of January last, to determine the points in dispute.

In the case, the plaintiffs put in evidence their patents, proved the great utility of their inventions, showing a great reduction in cost of reducing the ores of mercury by the continuous working furnace, and the more effectual saving of the mercury over any furnace used before the advent of the KNOX & OSBORN furnace.

The defence set up was, that the patents were wrongfully issued to the plaintiffs, being a combination of old devices, not patentable; and further, if the patents were held good, they (the defendants) had not infringed them.

This being the first attempt to sustain these patents, and there being some 15 to 20 furnaces built which are claimed as infringements, the case created great interest, and was to some extent a combination of all the interested parties in the State to break the patent, and thus end the possibility of claims against other companies being made in the future. In the course of the trial, every furnace which was ever heard of which was thought to contain any one of the devices of the KNOX & OSBORN furnace, was brought forward and discussed by the experts, who gave learned opinions of all the old furnaces and lime kilns ever sketched in books or even heard of, yet nothing was produced showing a continuous working quicksilver furnace, until the KNOX & OSBORN furnace was built.

It also appeared in evidence that since this furnace has been in operation no intermittent furnace of the old style has been built, showing a great revolution

in the manner of reducing mercurial ores, by which lower grade ores are now profitably worked, and many mines now paying expenses while being opened, which could not be worked with the old style of furnace.

After an elaborate charge by Judge SAWYER, the case was submitted to the jury on Monday last, who after a short deliberation, rendered a verdict sustaining every claim submitted to them in the plaintiffs' patents, and also found all the claims infringed as charged.

This may be regarded as a test case, having been very thoroughly and vigorously contested on both sides, and although there may be other suits embracing the same points of law as this, it is probable that the result in this one will be held as conclusive.—*Mining and Scientific Press.*

UTAH MINES AND ORE SMELTING WORKS.

Special Correspondence of the Engineering and Mining Journal.

SALT LAKE CITY, Feb. 20, 1876.

TO THE EDITOR: SIR—The heavy fall of snow in the mountains during the past month has impeded the shipments of ore from all of our neighboring mining camps. Bingham, owing to its favorable location, continues to make large shipments of ores, but only from mines lying near the bed of the Cañon. The "Revere," "Yosemite," "Nez Perces," "Montreal," Neptune," and "Jordan" are shipping from ten to thirty tons a day, while the "Winnemuck," "Saratoga," "Monumental," "Live Yankee," and a number of others are occasional contributors. The average assay of the large ore bodies of this camp being only from 12 to 25 oz. Ag. and from 35 to 45 per cent. Pb., speculators did not think this camp worthy of their attention, and prospectors preferred working in the "Cottonwoods," even though they had to lie idle six months in the year. This was only two years ago. These low grade ores, at that time, brought only 80c. to a dollar the ounce on a standard of 50 per cent. Pb. Freights were from six to ten dollars a ton to the smelters; the ores contained from fifteen to twenty-five per cent. of moistures, which counts as freight, but not as ore; all ores had to be sacked for handling; good mining timber was scarce, and cost from five to twelve dollars a cord. Under these circumstances it seemed that the larger and better the mine, and the larger the number of miners employed, the shorter the time necessary to bankrupt the owners. Then, too, Bingham had to compete with Cottonwood, which had a number of fifty-ton mines. In 1874 the narrow gauge railroad was completed from Sandy and the Jordan to Bingham, and in 1875, a horse tram-road was built connecting nearly all parts of the camp with the terminus of the railroad. This reduced freights to two and one-half dollars a ton, and allows ores to be shipped in bulk. Good Bingham ores, *i. e.*, not too silicious nor pyritous, are in active demand at $1.05 per oz. Ag. on a basis of 35 per cent. Pb., with 50c. for each unit over that, while galena and roasting ores are not so much sought after, and bring $1.00 per oz. Ag., on 45 to 50 per cent. Pb. The comparatively low price of the latter class is due to the fact that Utah superintendents, as a rule, know nothing of roasting except in heaps, and see no necessity of sizing the ores. They also prefer using *plenty* of fuel to get a good start. The experience of a prominent superintendent was that galena could not be roasted in piles or stalls.

When working these ores the raw matte produced was thrown over the dump. The result of such runs showed a loss which was attributed to the sulphuret ores, and no one wanted them. The Germania, Jordan, and Sheridan Hill works are now roasting in reverberatory furnaces, with good results. But to return, the increase in prices and decrease in expenses are what have stimulated Bingham miners, and old prospects are being worked diligently in the hope of striking a bonanza. A new feature in the camp is the finding of high grade milling ore. These veins were first found about a year since. They were generally very small and contained very high grade ore. The "May Flower," which has the largest veins, was rapidly developed and showed from one to three feet of about $40 ore. The workings now are down some 600 feet and I hear that the owners are so well satisfied that they intend building a mill in the spring. A second group of mines, of this class, including the "Aladdin," is at the head of main Bingham Cañon. They occur as cross fissures in a green stone dyke. This dyke, which is about 600 feet wide, I have seen at different points for a distance of ten miles, and have never found base ores in its neighborhood. Owing to the narrowness of the veins, and extreme hardness of the wall rocks, developments here proceed very slowly. The "Aladdin" and "Owyhee" have both shipped ores going over 100 oz., but in small quantities. Ores of this class are sold here on the rates made by the mill at Reno, Nev., with from 5 to 15 per cent. added (to these rates), according to the more or less favorable nature of the ore. From 12 to 15 feet of snow on a level, and the end not in sight yet, has somewhat dampened the ardor of even the most energetic ore-shippers in Little Cottonwood. They would turn their horses out in the morning to break a road down the Cañon, and get through by night, then go back to get their loads for the next day. The next morning it seemed as though the snow drifted deeper where their road was than anywhere else. Notwithstanding this, the "South Star and Titus" has shipped over 200 tons of ore of all grades, in the past three weeks. The "North Star" sent down about 70 tons of 2nd class, and the "Vallejo" about 100 tons of 2nd and 3rd class. The "Flagstaff" continues to supply and keep running two furnaces. The "Prince of Wales" group have some 70 men employed extracting ore, but must soon stop for want of stowage room, all available space in and about the mine being filled, and it is impossible, with present facilities, to ship anything. The "Reed and Benson" have been able to send ore out of Big Cottonwood as they have a covered tramway leading from the mine to the bed of the Big Cottonwood Cañon. The tramway connecting Alta City, L. C. with the Wahsatch and Jordan Valley Railroad was completed so late last Fall that the company could not cover it before snow fell, which renders it useless for the Winter. Next Summer it will be so protected that ore can be shipped the year round.

Since my last I learn that Mr. SALISBURY has gained the control of the "Grizzly," and will commence shipping ores as soon as the roads become passable, good Cottonwood ores being $1 15 per oz. Ag., on a basis of 30 to 35 per cent. Pb.

The McHenry mill, in Parleys Park, continues crushing Ontario ore. The company are trying to lease the Marsac twenty-stamp mill, to run with the McHenry. If unsuccessful in this, I hear that they intend building a forty-stamp-mill. Very favorable reports are received from the new mines in Bonanza City, Washington County, Utah. The camp has not confined itself to reports alone, having sent one lot of 14 tons of ore, assaying 381 oz. Ag., and a second lot of 20 tons, which goes over $700 a ton in silver. I have not seen the assay of the second lot. This new country is like JANNEY'S description of the Black Hills—very unfavorable, and not having the proper formations, but the metals are there. The only description that I have seen was very indefinite. The silver ore is found in seams, in two sandstone reefs (whatever they may be), but does not seem to go to the deep at all. One miner thought it the bed of a lake, from which the water had evaporated and left the silver. He said that he could find neither veins, pockets, nor "formation," only silver. This southern country, undoubtedly, presents a splendid field for theoretical research.

In the Stockton ore market the competition between the "Chicago" Company and Mr. LONGMAID has established Salt Lake prices. Should this continue, it will certainly affect the "Chicago" Company's dividends, as by their last printed statement, somewhat more than one-half their profits were made on purchased ores. Should it have no other effect, it will, in any event, give the miners encouragement, and open some new mines. The well-known "Mono" mine started work again about a week ago. The mine will be put in good condition, the shaft straightened, preparatory to sinking. The trouble with this mine seems to be that the ore in sight was extracted, and no developments made in new ground. There is no doubt in my mind that work was stopped just at the wrong time, and that the improved ground will yield as well, if not better, than the stopped ground.

At the late session of the Territorial Legislature two bills were passed, which, had they become laws, would have seriously affected the mining interests of the Territory. One bill authorized the levying of taxes, aggregating three per cent., on unpatented mines, which would have nearly stopped prospecting, and the development of claims which did not pay their way. The second gave the right to sue for damages, in case of death of live stock, in the neighborhood of smelting works, and forbade the use of water from streams used in irrigating. Under the provisions of this last act, an attack of epizootic would have soon closed the smelters.

The Governor vetoed the bills.

Mr. M. E. SMITH, Superintendent, furnished me the following report of the work of Furnace No. 3 at the Jordan Smelting Works. As it is, undoubtedly, the best run as yet made in Utah, you may find it interesting.

The furnace is ellipsoidal—30″×60″—inner dimensions; 10½ feet from tuyeres to feed door, 12″ from tuyeres to slag tap, 2′ from tap to sole. Has water-jackets extending from the tap upwards, 2½′ above the tuyeres; four 3″ tuyeres; blast pressure, 1⅜ lb. per square inch, furnished by a MCKENZIE blower. Fuel used, equal parts of coal and charcoal, taken by weight.

Consumption and Production of Furnace No. 3, Jordan Smelting Works, for Week ending 7 A. M., Feb. 20, 1876:

	Gross lb.	Net lb.	Lead. lb.	Silver. oz.
Ores—Jordan	121,165	103,991	31,197	779.83
Galena Extension	14,100	14,100	3,303	147.97
Montreal	60,450	56,823	28,695	446.42
North Star	137,000	120,560	43,833	4,922.46
South Star.....3rd class ore	125,250	110,220	15,430	803.50
Deseret	26,040	26,040	.....	182.28
Tiewaukee	25,525	20,165	1,411	435.16
Ira (lead ore)	12,887	11,365	3,579	235.31
" (lime ore)	14,647	13,888	.....	124.73
South Star.....1st class ore	93,952	75,497	20,384	868.21
Shower	82,650	79,344	40,862	1,295.95
Nez Perces	4,925	4,536	1,179	30.41
I. X. L.	2,545	2,545	1,081	19.48
	721,136	639,074	191,004	10,291.81

Gross tons ore consumed	360·1136
Net " " "	319·1074
Lead contained in ore, tons	95·1004
Silver " " oz.	10291·81
Lead produced, tons	74·1273
Silver " oz.	8730·
Loss of lead	21·85 per cent.
" silver	14·1-5 per cent.

Actual fuel consumed (no allowance for wastage), 12·8 per cent. on net charge; 11·4 per cent. on gross charge.

Including waste (allowed usually 10 per cent. on coke, 25 per cent. on charcoal).

Fuel consumed—15·10 per cent. on net charge; 13·5 per cent on gross charge.

In the losses of lead and silver given, allowance must be made for the matte, which is all saved, and dust, of which 80 per cent. is saved. As these two products were not kept separate from old stock, their value cannot be given. After deducting the value of those products, the seemingly large loss would be reduced more than one-half.

L.

PACIFIC COAST MINES.

Special Correspondence of Engineering and Mining Journal.

SAN FRANCISCO, Feb. 21, 1876.

THE DISCOUNT ON SILVER.

IT was shown in my last letter that of the entire bullion product west of the Missouri River during 1875 there was a little over forty-nine million dollars in gold, to thirty-one and a half millions in silver, and that 40 to 45 per cent. of the Comstock bullion was gold. There has of late been considerable agitation here in reference to the glut of silver under which we are suffering. While our prices of that metal are regulated by London quotations, it is well known that an undue issuance of trade dollars has been the means of increasing the evil so far as the Pacific Coast is concerned. The discount now on fine silver bars is about 9½ per cent.; on Comstock bullion, 6 to 8 per cent., according to the gold it contains; on ordinary silver coin 4 per cent.; on trade dollars 3 to 4 per cent, and Mexican dollars 5 to 7 per cent. With the certainty of a largely increased production of the precious metals, it may be supposed that silver has not yet reached its lowest point. It ought to be borne in mind, however, that the Comstock mines have only had a slight influence on the London market, and that the forty millions of fine silver which we are likely to produce this year will scarcely, in ordinary cases, seriously diminish its general value. Until buyers have been found for the immense amount of silver rejected in Europe as a circulating medium we cannot anticipate any great improvement. As a silver producing country, we ought to use silver coin in every State in the Union, and by that means something will be done to at least prevent a further reduction in its price.

While we are using legitimate means to bring about that result it would be a great blunder to adopt

THE COERCIVE HOME-DOLLAR POLICY

of Senator JOHN P. JONES, which, if correctly represented, proposes to make silver a legal tender for all debts, large or small. The Senator will hardly be able to reconcile his present financial proposition with his utterances only a year

ago. Then he was an uncompromising free trade, hard money man, and demonstrated the fact that the Government had increased its liabilities enormously by neglecting at the beginning of the war to make gold its money standard instead of issuing paper promises to pay. Now, he is prepared to substitute one depreciated kind of money for another, and in place of leaving each to find its own commercial level he proposes to force a new coin into circulation, apparently with the end in view of preventing a debasement of silver, and thereby affording a kind of trade protection to the producers of that metal.

The rag money advocates say in effect that a dollar is just what the Government makes it, or calls it, whether it be of paper, of leather, or of silver. As bank notes, or coin which are, at the option of the holder, convertible into gold, require no favoring enactment, it follows that a compulsory measure intended to sustain values must be the result of an inflation policy. In this light, Senator JONES has unquestionably become a silver inflationist. The solid foundation of gold on which he stood securely a year ago has been deserted, and now there is nothing under his feet but a thin yielding crust of silver.

WHAT THE GOVERNMENT CAN DO.

It is not wise in a government of our day to adopt any other than a gold standard in its financial system, but as we already have an established paper currency, we require to make the best of an existing evil by effecting such modifications in regard to it as are known to be practicable. With a dollar in gold the Government can now purchase fine silver worth $1 10½ in currency, so that an excellent opportunity is presented of hastening the return of specie payments. As the gold value of a fifty cent silver coin is only about 43 cents, it will cause scarcely any loss to the Treasury to substitute silver for fractional currency. Unless silver is made a legal tender for large sums the effect of bringing it into general circulation will be to increase the value of currency. If silver continues as cheap as it is at present, its substitution for paper may be carried on until the greenback will be so scarce that it will be worth a dollar in gold. The law under which private parties were enabled to use the mints, in coining trade dollars, without limitation, ought never to have been enacted.

THE SILVER PROBLEM SOLVED.

A new way of turning silver to a useful purpose has been discovered recently. Some Comstock friends of Senator WILLIAM SHARON gave him a dinner in the Palace Hotel, before he left for Washington. In front of each guest lay a bright silver tablet as thick as a half dollar piece, with an engraved list in French of the *recherché* viands adapted to the remarkable occasion. On taking his leave, each gentleman put this enduring forty dollar bill of fare into his pocket, and stowed it away among his precious things at home; let us rejoice that, barring unforeseen calamities, a quantity of silver has been retired from the market, which might have given us much trouble if it had fallen into the hands of a dozen poor widows, with ragged children at their knees, crying for bread. It is premature to say that any of our mining monarchs intend to shoe their carriage horses with silver plates.

THE DEBRIS FROM HYDRAULIC MINES

brought down by the streams of California are gradually filling up the river-channels and burying its lower adjacent lands. A joint committee on agriculture and mining has recently submitted a report to the Legislature of the State on this subject, and presented some interesting particulars in regard to the production of gold. It is estimated that between 1849 and 1876, the gold yield was $1,146,000,000, of which $1,000,000,000 came from ancient gravel beds. The expenditure, on canals, ditches, flumes, reservoirs, and tunnels, is put at $150,000,000. While from various causes the returns from gravel mines did not exceed $12,000,000 in 1875, it is thought that within five years $20,000,000 per annum will be realized. The building of reservoirs is now so general that within two years 70,000 miners' inches of water will, in the aggregate, be available in the dry season, which will be equal to a flow of 800 cubic feet per second. There have been 30,000 acres of land covered with detrital matter, but of late it has been ascertained that the soil thus produced is far from being worthless, and that under the decomposing action of time it may become largely productive. In some cases, muddy water coming from the mines has been used with great advantage in irrigating hill-lands, the sediment left on the surface having a fertilizing effect.

NEVADA AND THE CENTENNIAL.

The Legislature of Nevada made an appropriation, a year ago, of $20,000, to secure a creditable representation of the State in the Centennial Exhibition. In order that a collection of ores might be obtained, the State mineralogist and another gentleman were commissioned to visit the principal mining districts, and solicit specimens from mine owners. Though this duty was faithfully performed, and ores of great value were obtained, it appears now that the Nevada Centennial Commissioners propose to exhibit the collection, along with that of the Smithsonian Institution, so that the Silver State will have no distinctive representation in the International display. This is, certainly, a great mistake. The chief treasure-house of the United States ought to be specially represented. A barren mountain land becomes prominent as containing the richest and most extensive gold and silver mines in the world, and people wishing to know something about its resources ought to have the opportunity afforded them, at the Exhibition. To devolve that duty on the officers of an institution, who, probably, were never within thousands of miles of Nevada, would be a very foolish proceeding, alike injurious to the State and to mining business, generally. The commissioners, with the wisdom of raw boys, propose to put up and run in the Exhibition building a 5-stamp quartz mill, as if that gim-crack concern could rightfully be called a product of the State, or could effect any other purpose than the swallowing up of the Legislative appropriation. As well might California represent its wheat-growing capacity by the exhibition of a threshing machine, with a dozen Chinamen constantly tossing straw into the air by its side. The manufacturers of quartz mills are the proper parties to exhibit such structures, and not the representatives of a State.

MINING NOTES.

With the exception of the bonanza stocks there is no life in the Mining Share Market.

An advance of a dollar or two in the prices of speculative stocks, leads at once to depressing sales. It is understood that the rich ore, found in the north end of the California Mine, will extend into the Ophir ground. It is also said that a promising discovery has been made on the 1,630-foot level of the Ophir, 150 feet farther north than any point where ore has been found heretofore. There has been no development of note in any of the unproductive Comstock-ian mines. The discovery of a new bonanza is all that is required to bring about a time of wild speculation in stocks.

It was hoped that by cross-cutting in the Savage, something great might have been struck, but that mine has now a depth of 400 feet of hot water in its works. A foolish story has been put into circulation about several blood-red fishes, without eyes or scales, having been brought up out of this underground lake. Since the water is represented as having a temperature of 128° Fah., the invention is absurd enough.

The mining dividends paid for last month aggregate $1,279,000. In addition, a claim called the West Comstock paid a dividend out of mines said to have been realized by the sale of a portion of its stock. It is stated that the California Company will begin to pay a $2 or $3 dividend in May, the former being equivalent to $10 by the Consolidated Virginia, the shares being five to one.

YIELD OF COMSTOCK ORES.

I find, from the returns made to the Assessor of Storey County, for the last three months of 1875, that the ores worked from the following mines yielded the amounts, per ton, indicated—Consolidated Virginia, $119; Belcher, $32; Imperial, $27; Chollar Potosi, $16; Hale and Norcross, $17; Crown Point, $17; Empire, $12; Justice, $23; Yellow Jacket, $16. As the average for Consolidated Virginia, during the year, was about $99 per ton, it is evident that the ore extracted at the beginning of the year must have been comparatively poor.

There were some important mining developments made in Eastern and Central Nevada during 1875, but owing to the engrossing attention given to the Comstock range, they have excited little notice.

In Columbus, Spanish Belt, Tybo, Danville, Ward, Cherry Creek, Cornucopia, and railroad districts, good bodies of pay-ore have been exposed. On the Comstock lode there are mining claims which have been worked for fifteen years without yielding any returns. If a little of the money so freely supplied for that profitless kind of work were expended on promising mines in other parts of the State where rich ore is in sight, the returns, under good management, would be highly satisfactory.

J. D. EMERSLEY.

SELECTED LIST OF PATENTS.

FOR THE WEEK ENDING FEB. 25, 1876.

Relating to Mining, Metallurgy, Gas Making, Engineering, etc. Reported for the "Engineering and Mining Journal" by Louis Bagger & Co., Solicitors of Patents, Washington, D. C.

173,134. Machines for Punching and Bending Metal, J. Morgan, Pittsburgh, Pa.—Every revolution of the crank causes the shaft and its pinion to make a part revolution each way, imparting at one-half of its motion an advance motion to the rack, and at another half a reverse motion, during the former of which the extensible rack engages the pawl on the carriage, feeding it forward. The die is adjustable laterally, and longitudinally, and the punch is attached eccentrically to its stem, is rotatable to bring it to the different positions given to the die, all to vary the distance of the holes from the beveled edge.

173,146. Ratchet-Drills, H. R. Way, Halifax, Nova Scotia.—The teeth of the ratchet segments in the forms are inclined in opposite directions, in virtue of which one of said segments will engage with the toothed collar upon every movement of the operating lever, thereby causing the drill holder to receive a continous rotary motion. The feed is effected by a pivoted dog which is operated to turn the rag wheel (clamped to its feed screw) once during every revolution of the holder by the adjustable slide.

173,190. Machine for Threading and Cutting off Gas Pipes, Levi W. Stockwell, Ravenna, Ohio.—A cutting-tool within one of the guides, adjustable up to its work by a thumb-screw, and a clamp-bearing against the curvings to fix the guides and the dies while the work is done.

173,191. Machines for Tapping Gas and Water Fittings, L. W. Stockwell, Ravenna, Ohio.—The chuck-carrier is fed forward, presenting fittings to be acted upon in turn, and thrown back to its normal position when all the work has been done and the taps fed up and withdrawn, all automatically. Right and left hand screw-threads may be cut at the same time.

174,192. Mandrels for Rolling Metal Tubes, S. P. M. Tasker, Philadelphia, Pa.—One of the rolls is made concave in the greater portion of its length, and is also so formed as to have a bearing near each end of a counter circular form to the swelled surface of the other roll. The surface of the two rolls, in virtue of this construction, not being as liable to become impaired by wear at their places of contact as when they only touch tangentially.

173,207. Earth Augers, W. McK. Burns, Concordia, Kans.—The square auger shaft is rounded below the guide tube, to prevent twisting in the square part, and consequent jamming. The bit is formed on an acute pitch in the body portion, with a less acute point. A detached T plate is secured to the bottom of the auger, against which the pivoted reamer works. The cutter-bit, reamer-bit, and blade-bit are all connected to an arm on the shaft, and a straight blade projects down on one side of the bucket as far as the cutting-bit, to balance the lateral strain.

173,208. Methods of Obtaining Water, A. Byram, Atchison, Kans.—This is a method of gathering and drawing water from the earth by burying therein the perforated vessel A, and connecting the bottom thereof with the surface of ground by a pipe on a lower level.

STEVENS INSTITUTE OF TECHNOLOGY.—Popular Scientific Lectures for 1876. Tuesday evenings, at eight o'clock.

February 22.—Production of Light from Mechanical Force, by Magneto-electric Machines, including the Gramme Machine. Dr. GEORGE F. BARKER, of the University of Pennsylvania.
February 29.—Production of Light from Mechanical Force, by Magneto-electric Machines, including the Gramme Machine. Dr. GEORGE F. BARKER, of the University of Pennsylvania.
March 7.—How the Earth is Weighed and Measured. Prof. C. A YOUNG, Dartmouth College, N. H.
March 19.—The Moon. Prof. C. A. YOUNG, Dartmouth College, N. H.
March 21.—The Di Cesnola Collection. WM. HENRY GOODYEAR, Esq., New York.
March 28.—The Use and Abuse of Nitroglycerine. G. M. MOWBRAY, Esq., North Adams, Mass.
April 4.—The Coral Islands; their Nature, Growth, and Geographical Distribution. Prof. A. GUYOT, Princeton, N. J.
April 11.—Industrial Applications of Carbonic Acid, Gaseous, Liquid and Solid. Prof. A. R. LEEDS, Stevens Inst. of Tech.
April 18.—Character and Measurements of Musical Vibrations. Prof. C. F. BRACKETT, Princeton, N. J.
April 25.—Harmony and Discord, with Optical Studies. Prof. C. F. BRACKETT, Princeton, N. J.
May 2.—The Caliph Haroun Al Raschid. Prof. JAMES C. MOFFAT, Princeton, N.J.
May 9.—Porcelain and Pottery. Prof. CHARLES F. CHANDLER, Columbia College, N. Y.
May 16.—The Optics of Photography. President HENRY MORTON, Stevens Institute of Technology.

Course Tickets.....$1.50.

STATISTICS OF COAL PRODUCTION.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.

Comparative Statement for the week ending Feb. 26.

Tons of 2,240 lb.	1876.		1875.	
	Week.	Year.*	Week.	Year.*
Wyoming Region.				
D. and H. Canal Co	†....	240.866	62,914	396,987
D. L. and W. RR. Co....	‡5,585	213,497	....	318,687
Penn. Coal Co	21,697	179,259	20,141	175,957
L. V. RR. Co.....	15	1 4,754	25 544	181,088
P. and N. Y. RR. Co....	....	3,952	957	999
C. RR. of N. J	....	114,446	7,225	24,366
	27,297	865,774	116,781	1,118 084
Lehigh Region.				
L. V. RR. Co	7,614	2.1,285	4,176	86,004
C. RR. of N. J.....	63	138,896	2,527	2,639
D. H. and W. B. RR....	774	3,522	658	3,056
	8,471	353,703	7 361	91,699
Schuylkill Region.				
P. and R. R. RR. Co.....	7,753	261,275	26,177	121 614
Shamokin & Lykens Val.	..	24,365	17,510	76,260
	7,053	285,640	43,687	197,894
Sullivan Region.				
Sul. and Erie RR. Co....	351	8,380	354	1,938
Total	43,172	1,514,497	168,183	1,419,615
Increase	..	..	..	..
Decrease	..	..	..	..

* Year beginning January 1st.
† This reports has not been received for three weeks.
‡ Three weeks.

The above table does not include the amount of coal consumed and sold at the mines, which is about seven per cent. of the whole production.

The receipts at Port Richmond for the week were 241 tons, shipments 6,000 tons, and balance on hand 121,700 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch and Cumberland and Pennsylvania Railroads amounts to 333 tons, as compared with the corresponding period in 1875.

Perth Amboy business :

	Tons.
Received for the week	1,082
Shipped for the week	3.916
On hand Feb 19.....	90,023

Receipts of Coal at Boston. for week ending Feb. 25, and years from September 1st, 1874 and 1875.

From	Week. Tons.	Previously. 1876. Tons.	1875. Tons.
Alexandria and Georgetown	90	53,464	45,700
Philadelphia.....	3,046	339.472	246,532
Baltimore	606	72,673	69,644
Other places.....	3,538	146,712	99,487
Great Britain.....	—	2,510	1,733
Nova Scotia.....	—	12,851	14,105

The Exports of Coal from Baltimore for the week were 2,145 tons, and since Jan. 1st, 3,557 tons, as against 6,223 tons for the corresponding period of 1875.

Belvidere Delaware RR. report.

	Week.	Year 1876.	Year 1875.
Receipts of coal at Coal Port (Trenton)	—	4,701	..
" " " South Amboy....	196	31,830	16,167
Shipments at Coal Port (Trenton).....	—	..	..
" South Amboy.....	2,296	42,932	45,694

The Production of Bituminous Coal for the week ending Feb. 26, was as follows :

Tons of 2,000 lb., except where otherwise designated.

Cumberland Region, Md.	Week. Tons.	Year ,Tons.
Tons of 2,240 lb	20 533	147,733
Barclay Region, Pa.		
Barclay RR., tons of 2240 lb	9,125	54,778
Broad Top Region, Pa.		
Huntingdon and Broad Top RR.....	3,345	22,536
*East Broad Top	1,559	9,335
Clearfield Region, Pa.		
*Snow Shoe	1,053	5,837
*Tyrone and Clearfield.....	19,303	108,198
Allegheny Region, Pa.		
*Pennsylvania RR	3,606	23.833
Pittsburgh Region, Pa.		
*West Penn. RR	3,992	26,065
*Southwest Penn. RR	1,103	8,655
*Penn. & Westmoreland gas coal, Pa. RR.	12,951	81,140
*Pennsylvania RR.....	6,581	44,122
Kanawha Region, W. Va.		
*To Feb. 14.		

The Production of Coke for the week ending Feb. 14.

Tons of 2000 lb.	Week. Tons.	Year. Tons.
Tyrone and Clearfield.....	..	..
Alleghany Region.....	..	..
West Penn. RR.....	944	5.427
Southwest Penn. RR.....	7,745	50,539
Penn. & Westmoreland Region, Penn. RR.	735	4.417
Pittsburgh, Penn. RR.....	5,521	29.145
Total.....	14,845	89.548

COAL TRADE REVIEW.

NEW YORK, Friday Evening, March 3, 1876.

Anthracite.

There is a little more business doing than last week, but the quantity of coal moving is still quite unimportant. The companies are having numerous applications from consumers and would-be contractors and the whole trade will probably be very well canvassed before the end of the month.

At the present writing it looks as though only a few favored middlemen would have a chance for an existance in the anthracite trade this year, and that the companies would contract to supply the greater portion of the trade, or the best of it, at least. It is too early to say much of the prospects of a faithful observance of the spirit of the programme, but loop-holes are already being discovered, and it is doubtful if the workings of this year's business will be much more harmonious than those of 1875. This, however, will not make itself known until after the contracts are made.

It is undecided when a general resumption of mining shall take place, but it is agreed by nearly all, that it should be postponed until a later date than the 13th inst., at which time it was originally understood that a resumption would take place.

We refer to our Philadelphia letter for an account of the doings in that city, including actions of the Schuylkill Exchange.

Bituminous.

The shipments of bituminous coal from Central Pennsylvania are increasing, although business has not fairly opened. The price of Cumberland coal has not been established for this year, nor is it likely to be until it is known what action the Maryland Senate will take upon the bill now before it, to reduce the rates of freight on the Cumberland and Pennsylvania RR.

Gas coals are offering at $4 25 at Baltimore, or at the same price at which Cumberland was sold last year. The Baltimore and Ohio Railroad Company accepts very liberal rates of freight on this coal, its apparent object being to secure an increase of business. If the same policy were adopted towards the Cumberland business, the hopes of the company might be realized, and shipping wharves and cars, which at the present time are almost unemployed, might be made profitable to the Railroad Company, and the country generally be benefitted at the same time.

We are indebted to the courtesy of Mr. GEO. M. TAYLOR, Auditor of freight receipts of the Pennsylvania Railroad, for the following report of the coal tonnage of that road during the year 1875. We are also under great obligation to him for a most elaborate and valuable statement of the coal tonnage of the Pennsylvania Railroad during the past twenty-three years, furnished for use in our Centennial Report for coal production. The labor expended upon this statement was enormous; it is a practical demonstration of the interest taken both by the company and Mr. TAYLOR in providing for such a representation as will show the growth and importance of our great coal producing industry.

Gas Coals.—There appears to have been nothing further done in these coals; most works are pretty well supplied, and but little business is left for consummation. There will be but little, if any, Provincia lcoals sold in this market this year.

STATEMENT OF COAL TONNAGE FORWARDED TO ALL POINTS BY PENNSYLVANIA RAILROAD, 1875.

FROM	Anthracite Tons. East.	Anthracite Tons. West.	Bituminous. Tons. East.	Bituminous. Tons. West.
West Phila. (other roads).		9,758		
Columbia (received by canals)	35,324	260		
Rockville, via P. & RR ..	70,611	22		
Marysville...	609,682	46,528		
Aqueduct (record by canals)	1,477	16,129		
Other points.....	13,891	41,414		
East Broad Top			53,561	
Huntington & Broad Top.			137,631	48
Cumberland			179,728	223
Snow Shoe.....			61,84	585
Tyrone & Clearfield			914,913	661
Gallitzin & Mountain			197,838	26,379
West Penn. Railroad.....			142,313	133,651
South West Penn. RR...			101,802	47,842
Gas Coal (Westmore.and).			684 955	84,988
Pittsburgh			71,886	478,968
Lewesburgh, Centre & Spruce Creek RR.		12,111		348
Danville, Hazleton Wilkes Barre Railroad.....	16,876	107	835	
	747,841	233,587	2,547,311	1.202,693

PHILADELPHIA, Feb. 26, 1876.

Coal Trade of Philadelphia.

PHILADELPHIA, March 3, 1876.

This has been an eventful week for the Schuylkill operators. Efforts to ascertain what would be the rate of transportation on coal sold at fixed rates to consumers, according to the programme of the associated companies, have been in vain. The agents of the companies are now offering to contract at those fixed rates by explaining the programme to the consumers, while the operators who sell their own coal are unable to do so, not knowing what the charges for transportation are to be. These will, it appears, depend entirely on the kind of guarantee the operators are able to offer to the company respecting the adherence to the circular rates during the season, which the company is pledged to see carried out. Two meetings of the Coal Exchange have taken place, one yesterday afternoon, and the other this morning, and progress has been made, but not sufficiently to warrant the announcement of tolls. The last meeting adjourned to next Tuesday. It is understood that if all join in the pledge the tolls will be 40c. lower on coal sold at current prices, and 60c. on coal sold on registered contracts, and if they do not, that the tolls will remain the same. This is a powerful weapon held over the heads of the operators, and which operates rather unjustly on those who are willing to act in concert with the company. However, the experience of last year shows that unless something of the kind be done, the prices fixed monthly will be a dead letter. At the meeting the sense of the operators was taken on the question of not starting before the 3d of April next instead of the 13th inst, as originally agreed upon, and the opinion that it would be the best course to pursue is almost unanimous, with the proviso that it will be a general thing. The proposition originated with the associated companies, and it is therefore probable that this will be carried out. Considerable stir has been created by the announcement in the papers that the Coal and Iron Company had transferred their retail business in this city to the well known firm of BRICE & SHEAFF, who took charge of it on the 1st inst. The excitement did not last long, as it is well understood now that it is a mere substitution of a firm doing the business by contract for the company, for an agent doing it at a salary, the company using the yards as storing places, carrying the coal, fixing the prices, and controlling the business fully as much as ever before. Every telegraph operator, express agent, etc., remains an agent of the company, receiving a commission for selling their coal, as well as some of the bar-tenders at some of the hotels. No boot-blacks have yet been engaged, but it is soon coming to that. On the line of the road every station agent is being converted into an agent for selling the company's coal, and Reading customers can order their ton of coal, or buy a car of it, while consuming some of the company's lager and pretzels. No one could foresee to what use could be brought this vast machine—the Reaping Railroad, under a progressive management. Orders continue very scarce. Freights are dull at $1 90 to $1 85.

Wholesale Prices of Anthracite Coal for March, f.o.b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
‡Lackawanna and Scranton at Hoboken and Weehawken...	4 60	4 70	4 80	4 90	5 50	4 70
Pittston at Newburg...	4 45	4 55	4 65	4 75	5 35	4 55
Wilkesbarre at Port Johnston.	4 60	4 70	4 80	4 90	5 50	4 70
Plymouth, R. A.,.....	.....	.....	4 80	5 00	5 60	4 80
Susque. Coal Co. at Amboy W.A.	4 60	4 70	4 80	5 00	5 50	4 80
Kingston at Hoboken.....	4 60	4 70	4 80	4 90	5 50	4 70
Lehigh Coals.						
Old Company at Port Johnston	5 10	....	4 90	4 90	5 50	4 80
Old Company's Room Run "	5 10	....	4 90	4 90	5 50	4 80
§Sugar Loaf, Hobok. &Amb.**	5 1	....	4 90	4 90	5 50	4 80
Lehigh Coal Exchange "	5 10	....	4 90	4 90	5 50	4 80
Honey Brook Lehigh.....	5 10	....	4 90	4 90	5 50	4 80
Beaver Meadow at South Amboy	5 10	....	4 90	4 90	5 50	4 80
Schuylkill Coals at North 9th st., Brooklyn, E. D.†						
Schuylkill white ash.....	4 60	4 70	4 80	4 90	5 50	4 70
Schuylkill red ash	..	....	...	5 00	5 60	4 70
Shamokin white and red ash..	...	...	....	5 00	5 60	4 70
Lorberry.....	....	...	5 70	5 70	5 70	4 75
Lykens Valley.....	..	....	6 10	6 10	6 10	5 20

* Contractor's prices are 20c. per ton less.
† The prices of Schuylkil coals for shipment from Philadelphia are 35c. per ton less than at Brooklyn.
‡ Boats towed by the D. & H. C. Co. at its expense to and from New York harbor.

	Per ton.
Freight from Hoboken and Weehawken to New York	35@40c.
" " Elizabethport & Port Johnston to N. York.	40c.
" " South Amboy to New York.....	40c.

Freight by the boats of the companies from Hoboken, Port Johnston, Weehaken, Rondout, South Amboy and Perth Amboy to New York City and vicinity 50c.

Freight by the Pennsylvania Coal Company's boats from Newburg to New York 65c.

Prices of Anthracite Coal, f.o.b. at New York Shipping Ports, to actual consumers with whom seasoncontracts may be made.

	Lump.	Steam.	Broken.	Chestnut
March.....	4 20	4 30	4 40	4 30
April.....	4 20	4 30	4 40	4 30
May.....	4 25	4 35	4 45	4 35
June....	4 30	4 40	4 50	4 40
July.....	4 35	4 45	4 55	4 45
August.....	4 40	4 50	4 60	4 50
September.....	4 45	4 55	4 65	4 55
October.....	4 50	4 60	4 70	4 60
November.....	4 55	4 65	4 75	4 65
December.....	4 60	4 70	4 80	4 70

Prices at Port Richmond, Philadelphia, will be 25c. per ton lessthan the above.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich, Philadelphia.....	$4 50	$6 00
" " at S. Amboy....	5 50	6 00
Red Bank Cannel Pa. at Philadelphia....	8 00	8 50
" " South Amboy..	8 50	....
" Orrel.....	6 00	6 50
Youghiogheny, Waverly Co., at Balt....	4 25	5 75
Despard, West Va., ...	4 50	6 00
Murphy Run, West Va., at Baltimore..	4 50	6 00
Fairmount, West Va,, " " ...	4 50	6 00
Newburgh Orrel, Md. " " ...	4 50	6 00
Cannelton Cannel, W. Va., at Richmond.	9 00	10;
" Splint, " "	4 50	6
Peytona Cannel, " "	8 75	
Straitsville " at Sandusky, O.....	nominal,	

Manufacturing and Steam Coals.

Cumberland, at Georgetown and Alexandria, Va ..... 4 00@4 25 5 25@5 50
Cumberland, at Baltimore ..... 4 25@4 35 5 75@6 00
Kittanning f o.b. Canton, Baltimore.. 4 25@4 35

Broad Top, at the mine, per 2,000 lb., 1 1c. f. o. b. Greenwich, Philadelphia, per 2240 lb , 3 90, 4 00. 4 25 and 4 50, according to destination ; at Amboy, 5 00 ; New York, 5 45.

Clearfield and Allegheny, "Kittanning," "Sterling," "Sonman," and "Eureka," at the mines, per 2000 lb , 90 ; at Greenwich, Phil., per 2240 lb., 3 90, 4 00, 4 25, and 4 50, according to destination ; f. o. b. South Amboy, N. J., 5 00 ; New York, 5 45.

Foreign Gas Coals.

	Sterling.	Am. cur'cy,
Newcastle, at Newcastle-on-Tyne	9/6@11/	6 50@ 7 00
Liverpool House Orrel, at Liverpool....	26/	13 00
Ince Hall Cannel " ...	42/	18 00@20 00
" Gas Cannel " ...	28/	13@14
Scotch Gas Cannel, at Glasgow, nominal,	25/ Gold.	7 50
Block House, at Cow Bay, N. S	2 00	5 00
Caledonia, at Port Caledonia	1 75	4 75
Glace Bay, at Glace Bay.....	1 60	4 75
Lingan, at Lingan Bay.....	1 75	....
Sydney, International and Reserve mines, at Sydney	2 00	5 50
Pictou, Albion & Vale mines, at Pictou.	2 25	5 75

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard.....	$5 50	$5 80	$5 00
Lackawanna coal, delivered	6 25	6 50	6 00
Wilkes-Barre, "	6 75	7 00	6 25
Lehigh & Locust Mountain, del'd .	7 00	7 25	6 50
Schuylkill Red Ash, del'd.....	7 50	8 00	

Our retail quotations of Pittston Coal are based on the actual selling rates of the company, nominal quotations of grate and stove are 20c., and of nut 30c. per ton above these rates. The Cost of delivery ranges from 40 cts. to $1 10 per ton, according to distance from the yard.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb	$23 00
Liverpool House Cannel " " "	†22 00
American " " " "	15 00
Kanawha splint, " " "	15 00
American Orrel " " "	11@14
Red Bank Cannel " " "	14 00
Cumberland " " "	9 00

† This quotation is furnished to us by Messrs. WARD, TALBOT & OLYPHANT.

Baltimore, Md. Feb. 29, 1876.

Reported by our Special Correspondent.

No change.

ANTHRACITE.

Wholesale or Trade Prices per 2240 lb.

Wilkes-Barre "Lee" or "Diamond," Pittston and Plymouth. White ash.	In cars at depot.	By boats afloat.
Lump and steamboat	$4 80	$4 65
Broken.....	5 55	5 40
Egg.....	5 92	5 77
Stove.....	6 17	6 02
Nut.....	4 97	5 10
Shamokin, (red or white ash), and "Boston," freeb white ash,		
Egg	5 95	5 79
Stove.....	6 15	5 99
Lykens Valley, red ash,		
All sizes.....	6 55	6 37

From wharf or yard, wholesale, 50@75c. additional.
By retail, all kinds and sizes, per 2240 lb. $7 00@8 00.

BITUMINOUS.

George's Creek and Cumberland f. o. b. at Locust Point.	4 15	4 50
West Virginia f. o. b. at Locust Point		5 50
Youghiogheny Gas, f. o. b. at Locust Point.....		5 50
Swanton Coal, George's Creek.....		4 40

Boston Feb. 26, 1876.

Coal is in a chaotic state. The meeting of the Combination on Thursday last. and its three-priced system for the season, had thrown dealers and consumers into the worst possible confusion, and broken up every semblance of confidence that a uniformity in price can be maintained. The experience of those who have bought from week to week their necessary supplies in this market the past year, gives them an inkling that their opportunities for "beating the list prices" will continue. The differences in freights are not the whole advantage, nor will miners' rebate checks be so frequent as heretofore. However, as the agents put it, "all the details have not been arranged, nor the regular programme laid out."

Bituminous coals are very quiet. The hitch in freights between the Baltimore and Ohio and the Pennsylvania has not been straightened, and dealers are quite at sea how to quote the markets.

Gas coals have had considerable business. The fact that the Westmoreland made its quotations $4.25 f. o. b. at Philadelphia in the gas engineers' convention in this city last week, and booked business by the strategy, was a stolen march on the Penn's $4.50 announcement a week previous, and Moore's $4.25 special. The market has been a little uncertain all the week.

Foreign coals are dull and stocks are light.

Freights are in light request, but skippers are anxious for charters. Four schooners have been taken from New York to Boston at $1 30. Steamer rates from Philadelphia are quoted $1.90.

Chicago, Ill. Feb. 29, 1876.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants.
Retail prices per ton of 2000 lb. delivered to buyer.

We have no change in prices of coal to report. Stocks of coal are ample. On account of the extrem ly warm weather here this winter the consumption of coal has diminished fully one-third Most of the dealers will have coal on hand when navigation opens this Spring. Prices are sustained.

BITUMINOUS.

Lehigh Lump.....	$10 50	Briar Hill and Erie ...	@ 7 00
Lehigh grate and egg	10 50	Walnut Hill, Pa.....	@ 6 50
Lehigh stove and chest..	11 00	Midway, Pa.....	@ 6 50
Lackawanna, Wilkes Barre and Pittston*		Cannel.....	....@ 8 00
Grate and egg.....	9 50	Blossburg	7 50
Stove and chestnut.....	10 00	Indiana Block.....	6 00
		Hocking "Brooks".....	6 50
		Wilmington and Illinois.	5 00

* 50 cents off these prices for car load lots to country dealers and manufacturers.

Cincinnati, O. Feb. 29, 1876.

Reported by our Special Correspondents.

Please quote following rates on coal here :

Per ton of 2 00 lb.	Bush.	Ton.
Youghiogheny, or Pittsburgh, afloat.....	7½c.	——
Pomeroy coal ..... "	5 c.	——
Kanawha " ..... "	7½c.	——
Cannel coal, according to quality "	16 c.	——
Semi-Cannel..... "	7½c.	——
The following are the retail prices delivered		
Youghiogheny	—c.	$3 00
Semi-Cannel.....	—c.	3 50
Pomeroy	11c.	2 50
Cannel	—c.	5 50
Kanawha Semi-Cannel.....	—c.	3 00
Anthracite	10 00@11 00	
Coke, at yard.	7c.	——
Coke, hard and soft, delivered.....	10c.	——

Detroit, Mich. Feb. 29, 1876.

Specially reported by Messrs. ROBINSON & KEYS, Dealers in all kinds of coal.

Per ton of 2000 lb.

Lehigh Lump, per ton.	$10 50	Blossburg.....	8 50
Lehigh " prep.sizes.	10 00	Briar Hill	7 50
Wilkes-Barre, Grate and Egg	9 00	Willow Bank.....	7 00
Wilkes-Barre, Stove and Nut.....	9 50	Erie.....	50
		Massillon.....	7 00

Erie, Pa. Feb. 20, 1876.

Wholesale, per ton of 2000 lb. Bituminous f. o. b.

Briar Hill lump.....	$3 75	Beaver lump...	$3 50
Midway.....	3 25	Cat Fish.....	3 00

Louisville, Ky. Feb. 29, 1876.

Specially reported by Messrs. BYRNE & SPEED.

WHOLESALE.

	per bushel		per bushel
Pittsburgh.....	10c	Pine Hill....	—
Raymond City.....	9c.	Kentucky.....	—

RETAIL.

	per bushel		per bushel
Pittsburgh.....	14c.	Peytona Cannel.....	20@22c.
Raymond City.....	13c.	Buckeye "	—
Pine Hill...	13c.	City-made Coke.....	11c.
Kentucky	12c.	Anth., per ton, $10 00 to 10 50	

Screened Pittsburgh per load..... $3 00
Screened Raymond City. 2 75
Pine Hill (Kentucky)..... 2 75
Cannel..... $5 to 5 50

Milwaukee, Wis. Feb. 28, 1876.

Specially reported by Messrs. R. P. ELMORE & Co.

We have no change to note in the price of coal, and trade in the same remains dull.

Retail price per ton of 2000 lb.

Lehigh Lump	$10 00	Briar Hill, select.....	$8 00
Lehigh Prepared	11 00	Blossburgh	8 00
Lackawanna (all sizes)..	10 00	Cannel	8 00
Pittston.....	10 00	Pittsburgh	7 00
Scranton.....	10 00	Steam coal...	5 00

New Orleans, La. Feb. 29, 1876.

Specially reported by Messrs. P. & R. DE VERGES, Wholesale and Retail Dealers in Pittsburgh, Anthracite, Cannel and other Coals.

Pittsburgh coal, retail, per bbl	55c.
" wholesale	28c.
" steamboats, per box.....	50c.
" to manufacturers, per bbl.....	45c.
" shipments, per hhd.....	$6 00
Anthracite, wholesale, per ton.....	....
" retail, "	....
Virginia Cannel, per bbl.....	80c.
Scotch " "	80c.
Mt. Carbon, wholesale, per bbl.....	...
" " retail, "	....
St. Bernard, wholesale, per bbl	50c
" retail, "	....

Richmond, Va. Feb. 29, 1876.

Specially reported by S. H. HAWES, Dealer in Coal.

Per ton of 2240 lb., f.o.b.

Kanawha Cannel.	$9 00	New River Bituminous,	$4 50
" semi-Cannel..	4 75	Clover Hill Coal.....	4 00
Coalburgh Splint	4 75	James River Bitum ...	3 30
Lewiston "	4 75	" " Carbonite,	5 80
Kanawha Gas coal.....	4 50		

San Francisco, Cal.

From the *Commercial Herald*, Feb. 17, 1876.

Imports from Jan. 1st to Feb. 1st :

	tons.		tons.
Anthracite.....	3,693	English.....	5,502
Australian.....	5,472	Vancouver Island....	5,737
Coos Bay.....	4,478	Rocky Mountain	64
Cumberland.....	2,044	Seattle.....	6,835
Mt. Diablo.....	8,653	Bellingham Bay.....	2,675

The arrivals during the week embrace a fleet of small vessels from Coos Bay, including 500 tons per *Empire*—in all, perhaps 2,000 tons of this favorite house coal. Other receipts embrace 944 tons Australian, per *Knight of Snowdown ;* 750 tons Seattle, per *Discovery ;* 1,550 tons do., per *Commodore ;* 720 tons Wellington, per *Amie ;* besides a constant supply from Mt. Diablo. The following vessels sailed from Newcastle, N. S. W., for San Francisco with coal since our last report : *John Irgens*, Dec. 21, 1,129 tons; *Stormy Petrel*, Dec. 21, 770 tons; *River Lune*, Dec. 21, 1,690 tons; *Tellus*, Jan. 5, 594 tons. The *Merchant*, at Sydney, and the *Oakworth*, at Newcastle, were both loading for this city. In the absence of reported sales we quote Australian, 10 25 @10 50 ex ship. The supply of Cumberland is well controlled, and in casks held at $22; bulk, $18. Lehigh is plentiful and prices nominal. We quote Bellingham Bay at $8 50 ; Coos Bay, $10 ; California Mt. Diablo Steam, $6 25@8 25 for fine and coarse respectively ; English and Scotch Steam, $9 50@10 ; Nanaimo, $9 50@10 ; Seattle, $9 50@10 ; Anthracite, $12@15 ; Lehigh, $14 @15 ; Wellington, $10 50@11. The *Enoch Talbot* from Seattle brings 1,900 tons.

Toledo, Ohio. Feb. 29, 1876.

Specially reported by Messrs. GOSLINE & BARBOUR.

Per ton of 2000 lb. on cars.

Hocking Valley.....	$3 40	Massillon	4 00
Straitsville.....	3 40	Youghiogheny.....	5 00
Shawnee.....	3 40	Blossburg.....	7 00@7 50
" nut.....	2 90	Cumberland.....	7 00@7 50
Briar Hill.....	5 50	Connellsville coke	7 00

ANTHRACITE.

Grate, screened	$7 50	Stove, screened.....	$7 75
Egg, "	7 50	Chestnut "	7 50
Lehigh Lump.....	9 00		

40 cents to $1 per ton additional for delivery at retail.

Halifax, N. S. Feb. 29, 1876.

Prices per ton of 2240 lb. in gold.

Sydney (old mines).....	$4 00	Little Glace Bay.....	3 35
Gowrie	3 35	Blockhouse.....	3 35
Victoria....	——	Albion (at Railroad).....	4 00

Toronto, Ont. Feb. 25, 1876.

Chestnut..... ..	$7 25
Stove	7 50
Egg and grate.....	7 25
Bituminous coal for domestic use.....	6 00
" " steam.....	3 50@5 50
Lehigh Lump and broken.....	7 50
Blossburgh.....	6 30

Montreal. Feb. 25, 1875.

Specially reported by Messrs. ROBERT C. ADAMS & Co.

Wholesale per ton of 2240 lb.

Scotch Steam.....	$6 00	Cape Breton Steam.....	$5 25
Pictou "	5 75	Newcastle Smiths.....	7 50

Anthracite at retail, per 2000 lb., delivered.

Egg	$8 50	Chestnut.....	8 50
Stove.....	9 50		

Rates of Transportation on Anthracite Coal to Tide Ports.

Lehigh and Wyoming Coals. per ton of 2240 lb.	From Penn Haven.	From Mauch Chunk.	From Hazleton**	From Upper Lehigh.	From Ashley and Sugar Notch.
To ‡ Newark, N. J. (117 miles), via Central Railroad of New Jersey...	2 41	2 27	2 74	2 74	2 97
‡ Mauch Chunk, Pa., via Central Railroad of N. J.....	14	..	56	47	71
‡ Philipsburg, N. J., (46 miles).....	86	72	1 25	1 25	1 58
Elizabethp't, (114 m) Pt. Johns., Hoboken & South Amboy, N. J., shipping and wharfage 35c. add.	2 05	1 91	2 40	2 38	2 61
High Bridge, N. J.....	2 40	1 95	2 80	2 54	2 72
Elizabeth, Cranford, Westfield & Elizabethport, for consumption,	2 41	2 27	2 74	2 74	2 97
Jersey City, N. J., (121 miles) and New York, via L. V. RR.....	2 85	2 40	3 17	3 24	3 54
Andover, via Delaware, Lackawanna and Western RR.....	3 30	3 10	3 70	3 69	3 99
Trenton Somerset Junction and Greensburg, via P. RR. Belvidere Division.....	2 65	2 45	3 05	3 04	3 34
Trenton, (97 m.) for shipment, including shipping and wharfage	2 11	1 95	2 45	2 46	2 76

From *Mauch Chunk* to *New York* (121 miles), (towing limits) and Jersey City† via Lehigh Valley RR..... $2 37
From *Mauch Chunk* to *Philadelphia* (93 m.) via L. V. and L. and S. RR. and North Penn. RR 1 75
††From *Phillipsburg, N. J.* to *Hoboken* (84 m.) for shipment via Delaware. Lackawanna and Western RR., Morris and Essex Division 1 14
From *Lackawanna Junction* to *Auburn, N. Y.*, (191 m.) for shipment, via Southern Central R R. in connection with Pa. and N. Y. R.R..... 2 53
From *Lackawanna Junction* to *Weedsport* (201 m.), for *Rochester and Charlotte*..... 2 59
From *Lackawanna Junction* to *Sterling* for *Oswego, N. Y.*.. 2 62
‖ To this point for all places between Rochester and Buffalo the rate is 2 53
* The rate to this point for Syracuse is..... 2 02
** Rates on line coal from Hazleton are 10c. per ton above these figures.

‡ The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be $1 15 per ton.

§ Twenty cents per ton less when five cars at a time to one party. Provided that where the reduction makes the rate $1 a ton, or less, the rate will be $1.

† Transportation on Coal destined for re-shipment from this point is 20c. less than above rate.

†† The rate for consumption to this point is $1 80.

The distances in the above table are computed from *Mauch Chunk*. From *Ashley* to *Mauch Chunk* the distance is 51 miles,

and from *upper Lehigh*, 33 miles. From *Hazleton* 24 miles, and from *Penn Haven* 8 miles.

From *Wilkes-Barre* to *Perth Amboy* via the Lehigh Valley Railroad Company, the distance is 161 miles, and from *Mauch Chunk* it amounts to 106 miles.

Freights.

Per ton of 2240 lb.

The following quotations are nominal, in many instances representing rates which have been ruling for some time past.

PORTS.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me.	....	2 40	....	....
Albany	*85	1 70	....	....
Amesbury, Mass.	....	....	....	....
Bangor, Me.	†2 00	3 00	....	1 30
Bath, Me.	1 60	1 80	3 00	1 30
Baltimore	....	....	....	....
Boston, Mass.	§2 00	1 50	2 50	1 25
Bridgeport, Ct.	*80	1 50	2 00	90
Bristol, R. I.	....	....	2 10	1 00
Cambridgeport, Mass.	§1 90	....	2 50	1 25
Derby	....	1 65	....	....
Dighton	....	1 70	....	....
East Cambridge	1 90‡	....	2 60	§1 25
Fall River	1 50	1 50	....	1 00
Hackensack	....	....	....	....
Hallowell, Me.	....	....	....	....
Hartford	....	1 65	....	....
Hoboken	†85	1 40	1 75	40
Hudson	....	1 65	....	....
Jersey City	....	1 40	1 75	40
Lynn, Mass.	†2 10	....	....	†1 25
Middletown	....	....	....	1 25
Mystic	....	....	....	....
Newark	....	1 50	....	....
New Bedford	1 50	1 60	2 10	90
Newburyport	2 10	1 70	2 65	1 40
New Haven	*80	1 40	190@2	85
New London	1 50	1 40	190@2	1 00
Newport	1 50	1 65	2 10	1 00
New York	85††	1 15	1 80	40
Norfolk, Va.	85	60	60	....
Norwalk	85‡	1 50	....	80
Norwich	1 50‡	1 90	....	1 00
Pawtucket	1 75‡	1 90	2 20	....
Philadelphia	....	1 00	....	....
Portland	1 95	1 50	2 50	1 25
Portsmouth, N. H.	2 05@2 1	1 70	2 75	1 40
Providence	1 50	1 40	2 10	1 00
Petersburg, Va	....	50	....	....
Portsmouth, Va.	....	....	....	....
Poughkeepsie, N. Y.	....	1 50	....	....
Richmond, Va.	1 00	70	....	....
Rockport	....	....	....	....
Saco	2 50	....	....	....
Sag Harbor	....	....	....	1 00
Salem, Mass.	2 00	1 60	2 60	1 25
Salisbury Pt., Mass.	....	....	....	....
Savannah, Ga.	....	1 50	....	....
Stamford	*80	....	....	90
Stonington	....	....	....	....
Taunton	.. .	..	....	....
Trenton, N. J.	....	....	....	....
Troy	...	....	....	....
Warren, R. I.	....	....	....	1 00
Washington, D. C.	1 00	....	....	....
Wareham	....	1 75	....	....
Weymouth	2 00	2 00	2 60	....
Wilmington, Del	....	1 00	....	....
Wilmington, N. C.	....	1 50	....	....

* And discharging and towing. † And discharging. ‡ And towing. § 3c. per bridge extra.

From Baltimore and Georgetown charters are very scarce, but few being reported to us. Our quotations from these points to the majority of Sound ports are therefore nominal.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, March 3, 1876.

American Pig.—The business doing is of an entirely hand-to-mouth character, and aggregates but little. Most buyers believe that iron cannot advance during the year, and this, judging from present indications, is a correct conclusion. In the past there was always some one who thought he saw a gleam of better days in the early future, but now no one expresses hope or predicts an improvement for some time to come. Although this market is in a very bad condition, yet the Boston market appears to be much worse, and credits are very closely examined. We continue to quote No 1 foundry at $23; No. 2, $21, and forge $19. We hear rumors from every quarter of lower prices having been accepted, and, although we give these some credit, we are unable to verify them. This very unsatisfactory condition of the market would make a reduction in price inevitable were it not that some producers are losing money at present quotations, and it then resolves itself into a simple "Darwinian" problem of the survival of the strongest. Except indeed the coal companies should recognize the justice of our oft repeated suggestion and reduce very materially the price of coal. We understand there is now a more favorable prospect of this being done than at any other former period.

Scotch Pig.—There is but very little business doing in this article, but as stocks are held in strong hands prices are fairly maintained. We quote: Coltness, $32@$33; Glengarnock, $30@$31: and Eglinton, $29@$30.

Rails.—We are unable to learn of any important sales. There are some negotiations for steel rails going on, which are likely to result in business. We quote iron rails, at mills, $42@$45, and steel, $60@$63.

Old Rails.—We are unable to learn of any business, and continue to quote $203 nominal.

Scrap.—There is but very little doing in this article, in fact, not enough to make a quotation. We however, quote nominally at 30@$31.

Baltimore. March 1, 1876.

We have to report continual dullness in the pig iron market, and no prospect of any improvement in the early future. Sales very light, at about quotations:

Specially reported by Messrs R. C. HOFFMAN & Co.

Baltimore Charcoal	$32@35	Anthracite No. 3	$2c@21
Virginia Charcoal	28@34	Mottled and White	17@19
Anthracite No. 1	23@24	Charcoal C B. Blooms, 72@72	50
" No. 2	22@23	Refined Blooms	60@62 50

Boston. Feb. 26, 1876.

Reported by our Special Correspondent.

We have nothing of particular interest to report since our last, in which we notice you say that an order has been placed for 10 tons of bar, &c., &c., we intended to say 3 to 400 tons.

We quote sales in lots of both Scotch and American pigs at $31@$34 for the various brands, and $22@$27 for American. Scrap iron is lower, with no sale. Bars are still sold in a jobbing way at low prices.

PIG has had a fair business considering the general economics in every branch of trade. The number of buyers for five and ten-ton lots has been increased and probably the week aggregates a movement of about 200 tons. Prices are somewhat irregular, ranging more upon the buyers' credit than the preference for brands. We quote No. 1 American at $25@29; No. 2. $25@27; and gray forge, $19@20. New York quotations on foreign are: Coltness $32; Glengarnock $30@31; and Eglinton $29.50.

BAR has had rather a better business, with a more liberal demand for odds and ends in heavy hardwares and blacksmiths' novelties. The market continues quoting $50 for guaranteed refined, and at this low figure shows no very remarkable strength. There have been a few letters of inquiry from Western mills as to stocks here and the prospects of a higher range in the spring, but so far as learned the trade are not enthusiastic on advanced quotations, nor are they carrying heavy stocks. The assortments are generally in good condition. The reported sale of 2,500 tons to one house during the week by two Western mills seems to be confirmed, but the quotations named are above the present selling prices of the house to receive the lot. The competition of the Burden and the Rhode Island horse-shoe companies seems to be fruitful of interest to blacksmiths and hardware jobbers, who are reporting the reception of as they suppose single kegs of the former for trial and examination. These shoes are quoting at $4.25 a keg, and are new in shape. The latter company have a strike on their hands, and gossips state nearly 20,000 kegs to supply their trade.

STEEL is having a better jobbing demand for all lines, with prices fairly steady. Sleigh shoe steel is jobbing at 4½c.

We quote American tool, 14@15c.; American machinery, 9@9½c.; Bessemer tires, 6¾@7¼c.; SWEET'S excelsior tire, 7½c.; English tool, 14c. to arrive and 14½c. from store, gold.

COPPER is dull and heavy, with quotations easy from 22⅛@22⅝c. Manufacturers are quoting a little irregularly over the canvass of three of four vessels to arrive likely to want a new fitting.

For manufacturers we quote new sheathing 30c.; for bolts and braziers, 31c.; yellow metal bolts, 20@29c.

LEAD is strong and in steady request, both from corroders and pipe and sheet workers.

We quote pig 6½c. for domestic and 6⅞@7c. gold foreign sheet 9½c. pipe 9c., currency; tin-lined pipe, 16½c.; bar lead, 9c., less usual trade or 10 per cent. discount.

ANTIMONY is scarce, at 14⅛@14¾c. out of first hands.

SPELTER is steady. The combination price for February has not yet been changed from $7.75, currency.

TIN is held with better spirits for Straits, the news being cabled that further shipments will be light. Plates are somewhat irregular, an incident in the experience of the Boston Can Company, who came into the market for 1000 boxes, and find the competition very warm between the two houses.

We quote Straits 18¼@18¾c; Banca 22½c; Refined English 18½ gold. We quote plates Charcoal I. C. $7.50; Coke, $6.50@7; and Terne at $6.25@6.75, gold.—*Commercial Bulletin.*

Chattanooga, Tenn. Feb. 28, 1876.

Specially reported by J. F. JAMES, dealer in pig iron, etc., 233 Market Street.

The market is dull and inactive. Inquiries from the West for cold short metal are numerous, and some large sales are looked for. I quote on 4 mos. time.

Tenn. Ala. and Ga. Charcoal, No. 1 foundry	$23@$24	
" " " " No. 2 foundry	21@	22
" " " " gray forge	20@	21
" and Georgia coke, No. 1 foundry	19@	20
" " " " No. 2 foundry	18@	19
" " " " gray forge	17@	18
White and Mottled	15@	—
Tennessee cold-blast car wheel	27@	28
Alabama " "	26@	27

Cincinnati. Feb 29, 1876.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

Below will be found closing quotations of our pig iron market.

CHARCOAL.			
Hanging Rock, No. 1 Foundry	$25 00@	....	—4 mos
" No 2, "	23 00@	24 00	—4 mos
" Mill	21 00@	22 00	—4 mos
Tennessee No. 1, Foundry	23 00@	24 00	—4 mos
Tennessee, No. 2, "	22 00@	23 00	—4 mos
" Mill	21 00@	22 00	—4 mos
Missouri, No. 1, Foundry	.... @	....	—4 mos
STONE COAL.			
Ohio, No. 1, Foundry	22 00@	23 00	—4 mos
" No. 2, "	21 00@	22 00	—4 mos
Ohio Mill	20 00@	21 00	—4 mos
Missouri, No. 1 Foundry	27 00@	...	—4 mos
" No. 2, "	26 00@	...	—4 mos
" Mill	24 00@	25 00	—4 mos
CAR-WHEELS.			
Hanging Rock, C. B.	40 00@	50 00	—4 mos
Tennessee "	30 00@	33 00	—4 mos
Missouri "	33 00@	35 00	—4 mos
Alabama "	30 00@	33 00	—4 mos
BLOOMS.			
Charcoal	60 00@	70 00	—cash
SCRAP IRON.			
Cast	50c.@	65	—cash
Wrought	90@1	10	—cash

Cleveland, Ohio. Feb. 29, 1876.

Messrs. C. E. BINGHAM & Co., quote as follows:

Per gross ton, on four month's time. Subject to change i market. Discount for cash 4 per cent.

FOUNDRY IRON.		
No. 1, Lake Superior Charcoal	28 00@	....
No. 2. "	28 00@	....
No. 1. Anthracite	26 00@	....
No 2, "	24 00@	....
No. 1, Bituminous foundry	28 00@	...
No 2, "	24 00@	....
American Scotch, No. 1, Cherry Valley	29 50@	....
" " B—1, " "	27 50@	....
" " No. 2, " "	26 00@	....
No. 1, Massilon	25 50@	....
B—1, "	26 00@	...
No. 2, "	23 00@	....
CAR WHEEL AND MALLEABLE IRON.		
No. 3 Lake Superior Charcoal	27 50@	....
No. 4 " "	28 00@	....
Nos. 5 and 6 "	28 00@	....
BESSEMER IRON.		
Nos. 1 and 2 Lake Superior Charcoal	28 00@	....
FORGE IRON.		
No. 1, Gray	23 00@	....
White and Mottled	22 00@	..

Indianapolis, Ind. Feb. 29, 1876.

Specially reported by NELSON KINGMAN, broker and dealer in pig iron, etc.

Prices remain the same.

Trade very dull at prices named below.

New Rails at mill	$48 00@	50 00	
Old Rails "	24 00@	26 00	
Hanging Rock Charcoal Pig No. 1 foundry	28 00@	29 00	—4 mos
" " " " 2 "	26 00@	28 00	—4 mos
" " " Mill	24 00@	26 00	—4 mos
Car Wheel C. B.	40 00,	nominal.	
STONE COAL.			
Indiana No. 1 Foundry pig Red Short	24 00@	26 00	—4 mos
" 2 " " "	22 00@	24 00	—4 mos
" 1 Forge "	....@	....	—4 mos
" 2 " " "	....@	....	—4 mos
Ohio No. 1 Foundry pig Cold Short	25 00@	26 00	—4 mos
" 2 "	24 00@	25 00	—4 mos
" Mill	23 00@	24 00	—4 mos
" No. 1 Foundry, Neutral	26 00@	28 00	—4 mos
" No. 2 " "	25 00@	27 00	—4 mos
Merchant Bar	2½c.—	3 mos	
1st quality C. H. No. 1 Boiler Plates, per lb	5	c.—	3 mos
1st " Com. Sheet for No. 24, W. G. "	4	c.—	3 mos
1st " Charcoal Sheet " " " "	5½c.—	3 mos	
Best Bloom Galvanized Sheet, discount	20 per cent	....	—cash.
2d quality " " "	30 "	....	—cash

f. o. b. in Indianapolis.

Louisville. Feb. 29, 1876.

Specially reported by Messrs. GEORGE H. HULL & Co.

The market is dull, but without change in prices.

The usual time, four mos., it allowed on the quotations below:

HOT BLAST—CHARCOAL.		
No. 1 foundry, from Hanging Rock Ores	$25 00@	26 00
No. 2 " " "	23 00@	24 00
No. 1, Mill, from " "	—@	—
No. 1. foundry, from Alabama, Georgia and Tennessee ores	23 00@	24 00
No. 2, foundry, from Ala., Geor'a and Tenn. ores	22 00@	23 00
No. 1, Mill, from " " " "	21 00@	22 00
HOT BLAST—STONE COAL AND COKE.		
No. 1, foundry, from Hanging Rock ores	23 00@	24 00
No. 2, " " " "	22 00@	23 00
No. 1, Mill, " " " "	21 00@	22 00
No. 1, foundry, from Ala. Ga. and Tenn. ores	23 00@	24 00
No. 2, " " " "	22 00@	23 00
No. 1, Mill, " " " "	21 00@	22 00
No. 1 foundry, from Missouri ores	24 00@	25 00
No. 2 foundry, from Missouri ores	24 00@	25 00
No. 1 Mill, from Missouri ores	25 00@	26 00
COLD BLAST—CHARCOAL.		
Car Wheel from Hanging Rock ores	35 00@	40 00
" " Tennessee "	28 00@	30 00
" " Alabama and Georgia ores	28 00@	38 00
" " Kentucky ores	28 00@	40 00

San Francisco, Cal.

From the *Commercial Herald*, Feb. 17, 1876.

The Australian Steamship *Mikado*, from Sydney, brought 346 ingots tin, and this now commands 22c. This article appears to be in growing favor, and is displacing Banca tin, held at 24@25c. as against 40@45c. before the free importation from Sydney began. We have no sales of tin plate to record. Pig iron continues in very large stock and prices nominal.

St. Louis. March 1, 1876.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

Our market remains very quiet, with no change in prices, and but little in demand. A better feeling, however, is manifested, and indications point toward better prices ere long.

We quote on four months' time:

Mo. Stone Coal No. 1 Fy.	$25@26	Massillon iron, A No. 1	31@32
" " " 2 "	24@25	" " B "	1.29@30
" " Gray Mill,	24@25	" " "	2.25@28
" Charcoal No. 1, Fdy.	24@25	Cold Bl. Car Wheel, Mo.	36@40
" " " 2, "	23@24	" " " " Tenn.	33@35
" " Gray Mill,	23@24	" " " " Ala.	33@35
Tenn. " No. 1, Fdy.	24@25	" " " " H. R.	32@33
" " " 2, "	23@24	Mo. Charcoal Blooms..	60@70
" " Gray Mill,	23@24	" Scrap "	55@60
Va. Coke, No. 1, Fdy.	25@26	" " hammered Billets	75@80
" " " 2, "	24@25	Assorted Bar Iron 2 35, 90days	
" "Gray Mill,	23½@24¼	No. 1 Wrought Scrap..	10 ch.
H. R. Char. No. 1, Fdy.	26@27	Heavy cast "	95 "
" " " 2, "	24@25	Light " "	60 "
" " Gray Mill,	24@25		

Montreal. Feb. 22, 1876.

We quote pig iron Eglinton and Clyde $21@21.50; Carnbroe $21 50@22; American $24,@26.; Summerlie and Calder $22.00@23.00; Langloan and Gartsherrie $22.00@23.00; Coltness $22.50@23.50; Hematite $30.00@31.00. Bar, per 100 lb., Scotch and Staffordshire, $2.25@2.30; best do., $2.50@2.60. Swedes and Norway $5.00@5.50; Lowmoor and Bowling, $6.50@7.00.—*Monetary Times.*

METALS.

NEW YORK, FRIDAY EVENING, March 3, 1876.

The metal market is in a very demoralized condition. Tin shows a large decline in London, which has affected prices here; copper is off a little, while lead, owing to a "corner," has advanced a fraction. There is but little business doing in any of the articles on this list, and and there is nothing upon which to predict the prospects of the Spring trade.

Gold Coin.—During the week past gold has ranged from 113⅞@114⅛, and closed at 114'.

Bullion.—The decline in fine silver bar still continues. In this market it has been from 2c.@2⅛c. per oz., while in London we note a decline of 1d. We are quoted to-day, in this city, $1.14 per oz., with the market weak at this unprecedentedly low figure. A telegraphic report quotes the San Francisco market 11 per cent. discount, which is the same as last week. Information by cable, from London, to-day, quotes 52⅛d. standard. Fine gold bar is quoted higher than a week ago. The quotations are as follows: this city, ⅛@⅜ per cent. premium; San Francisco, par ($20.67, gold, per oz.), and 84/ 7¾d. standard, in London.

Copper.—The sales of the week have aggregated about 400,000 lb. at 22⅛c.@22¼c., and it is said that some was sold as low as 22¼c. For the present, under a very depressed business, prices appear to have a downward inclination. It is thought, however, that when the roads begin to break up and overland shipments of copper are discontined prices must advance, especially as the copper in the market is strongly held, and manufacturers are but lightly stocked. London prices according to cable information of last Saturday, had declined; prices being at that time as follows: Chili bars, £78, and best selected, £86.

Tin.—Straits, in London, was quoted, by cable, to-day, at £72@£72 10/, which is a decline of £4@£4 10/ from the price we quoted a week ago. The Singapore quotation to-day is $21¾ per picul. Our market has been influenced by the decline abroad, and Straits is quoted weak at 17c., gold, for large lots, and 17⅛ @17⅜c. for small lots. L. and F., in five ton lots, is quoted at 16¼c., gold, and in small lots at 17@17⅛c. Banca is quoted at 22c.

Tin Plates.—These are quiet, and show some weakness in sympathy with pig tin. We quote, gold, per box: Charcoal Tins, $7.37½@7.62½, and ternes, $6.87½@7.12½; coke tins, $6.37½@6.62½; and ternes, $6.12½@6.25.

Lead.—On the 26th ult., the Government accepted bids for 200 tons of its lead as follows: 50 tons at 6·41c; 75 tons at 6·40c. and 75 tons at 6·39c. Since then there have been a few small sales at 62½c.

The holders of the bulk of the stock in this market are asking 6⅝c. gold, which may be quoted as the market price. At St. Louis prices are as follows, freight here 58c. additional: Missouri soft, 7@7⅛c., currency, and ordinary nominally at 6½c.—ordinary in that market is contracted ahead for several months. Foreign is quoted at 7@7⅛c. gold, with a sale of 50 tons at the former figure.

Spelter and zinc.—The combination price of domestic spelter remains unchanged, although outside lots continue to be offered at prices ranging as low as 7.60c., currency. Foreign is quiet at 7.40c., gold. Sheet zinc remains unchanged at 8¾@9c., gold,

Antimony.—This article continues steady at 14½@14¾c., gold.

Quicksilver.—This market is quoted at 65c., gold, per pound; San Francisco, 59@60c., and London £10.

The San Francisco *Commercial Herald*, of Feb. 17, says: During the current month contracts have been entered into for the year (monthly deliveries) for some 700 flasks for New York account at 65@60c., and more is now to be had at the latter rate for forward delivery. The nominal spot price is 62½c., but purchases have been made at 60@61c. for small lots. The supply on the market is temporarily short, owing to heavy rains, bad reads, etc., but all this will be of short duration and supplies more free, and prices ease off. The *Constitution* carried, en route for New York via Panama, 100 flasks, and for Germany 50 flasks. The *Newbern*, for Mexican ports, carried 168 flasks. The *Belgic*, for Hongkong, carried 282 flasks.

Our exports by sea the past week have been as follows:

To	*Flasks.*	*Value.*
Mexico	218	$10,422
New York	100	4,700
China	256	12,390
Japan	26	1,273
Totals for the week	600	$ 28,825
Previously since January 1st	4,126	195,178
Totals since January 1st	4,726	$224,003
Totals same period in 1875	1,341	153,265
Increase this year	3,385	$70,738

FINANCIAL.

New York Stocks.

FRIDAY, March 3, 1876.

The stock of the New Jersey Central Railroad closes strong, within a fraction of the closing price in our issue of the 26th ult., with sales of some 2,000 shares for the week. With this exception, the general market has gradually, declined closing at from one to three per cent. below last week's quotations.

The decline in Consolidated Coal Co.'s stock has been a notable feature of the week. Sales, aggregating over 5,000 shares, were made, closing at 44½, a decline of nearly $5 per share, or over ten per cent. from the highest point recorded in our last.

Quicksilver Mining Co.'s stock continues firm, at the advance noted in our last. The advance in this stock is attributed to the election of the new Board of Directors at the recent annual meeting.

The continued increase in the earnings of the St. Louis and Iron Mountain Railroad is having a very favorable influence on the stock of this company, which closed firm at the advance noted in our last, with sales of 2,400 shares for the week.

2,450 shares (hypothecated) of the Central Virginia Copper and Gold Mining and Smelting Co. shares, $25 each, were sold at auction on the 1st instant, at 15c per share.

Dividends and Interest.—The following companies have their dividend periods, and will pay interest on their bonds during the present month in New York, unless otherwise specified.

Hampshire and Baltimore Coal Co., scrip dividend of 6 per cent., payable on the 4th inst.

Minnesota Mining Co., dividend of 50c. per share, payable on the 15th inst.

American Coal Co., coupons and scrip interest.

Cameron Coal Co.—The interest on the bonds of this company is due during the present month.

Consolidated Coal Co. (Cumberland and Pennsylvania RR. bonds), coupons.

Delaware, Lackawanna and Western R.R., 2d mortgage and L. and B. 1st mortgage, coupons.

Nimrod Furnace Co., coupons.

Kemble Coal and Iron Co., coupons.

New Boston Coal Mining Co., coupons.

Union Iron Co. of Buffalo, N. Y., coupons.

Company Meetings.—The annual meeting of the Eagle Harbor Copper Co. will be held in New York on the 14th inst. The Petherick Copper Mining Co. will hold their annual meeting in Boston on the 21st inst.

Delaware, Lackawanna and Western RR.—This company is changing the gauge of their lines of road from 6 feet to 4 feet 8½ inches. The principal change will be on the Delaware, Lackawanna road proper, from Washington, N. J., westward. The Morris and Essex Division was originally made a narrow gauge road, and a third rail was laid down to accommodate the broad running trains. This third rail is to be taken up after the change is completed on the main road. The company expect to effect the change inside of forty-eight hours. The principal expense and labor will be in changing the gauge of the rolling stock, there being no less than 150 locomotives and over 11,000 coal cars, irrespective of the ordinary freight and passenger cars. Many of the company's locomotives have been put into the shops for reconstruction. It is estimated that the cost of the change, which is to be effected before the 1st of June, will exceed $1,000,000.

At the annual meeting of this company, held in New York on the 22d ult., the following officers were elected for the ensuing year: President, Samuel Sloan; Secretary, Andrew J. Odell; Treasurer, Fred. H. Gibbons. Managers—Wm. E. Dodge, Moses Taylor, George Buckley, J. J. Blair, Rufus R. Graves, S. B. Chittenden, John Brisbin, George Bliss, Percy R. Pyne, Wm. Walter Phelps, James Blair, Wilson G. Hunt, M. Massey, and A. L. Dennis.

The Poughkeepsie Bridge.—It is stated that this enterprise is progressing very favorably, and that the Boston merchants are responding liberally to solicitations for subscriptions for the prosecution of the work. The *Commercial Bulletin* says with regard to the matter:

"East of the Hudson are the Poughkeepsie, Hartford and Boston and the Connecticut Western railroads, now in operation from Poughkeegsie to Hartford, and connecting roads to all parts of New England. The New York and New England Road is now graded to within a few miles of Poughkeepsie, and, when completed will form another independent line from the bridge to Hartford, Boston, Providence, and New Haven. The bridge, of course, will provide immediate and profitable business for the road. West of the Hudson two new independent roads are now building, the Boston and South Mountain, from Harrisburg to Poughkepsie, and Lehigh and Eastern, direct from the Lehigh coal regions to the bridge. This short link of eighteen miles will make direct communication west of the Hudson and the entire system of roads to the coal and oil fields, the lakes, and the West and Southwest. It is averred that five main lines west of the Hudson will bring their business to the Poughkeepsie crossing as their nearest and cheapest outlet East, and the Pennsylvania Railroad and coal roads have expressed themselves as ready and anxious to use the bridge for their Eastern freights the moment it is open for traffic."

A bill was introduced in the New York State Senate on the 1st inst. to enable the Fishkill and Newburgh Railroad and Bridge Company to construct a bridge over the Hudson River at the Highlands below Newburgh, near Cornwall. It is intended to form an all rail connection between the Erie Railway and other lines west of the Hudson River with the Dutchess and Columbia Railroad and other lines on the eastern side of the river, leading to New York City and New England. A short link will also be constructed from the eastern end of the bridge southward, to terminate on the Hudson River Railroad near Cold Spring, 52 miles north of the Grand Central Depot. The bill authorizes the construction of the bridge at the height of 135 feet above high tide, and the lenghth of the bridge will be 2,695 feet from shore to shore.

Utah Central and Southern Railroads.—Following is the report of the freight traffic of these roads for the month of January:

	Tons.
Utah Central	11,383
Utah Southern	5,869

The leading item on the Southern was 1,756 tons ore and bullion; on the Central, 7,069 tons of coal and coke.

Quotations and Sales of Stocks and Bonds,

For the week ending March 3, 1876.

STOCKS.

	Highest	Lowest	Closing	Shares sold.
Pennsylvania Coal Co	—	—	275	50
Consolidation Coal Co	47¼	44⅛	44½	5 56
Spring Mt. Coal Co	—	—	64¾	
American Coal Co	—	—	*57	—
Maryland Coal Co	—	—	18	—
Del., Lack., and West. RR. Co.	119¾	117¾	117⅞	3156
New Jersey Central RR. Co.	107⅞	106⅜	107¼	2050
Delaware and Hudson Canal Co.	121½	120½	120½	190
Quicksilver Mining Co. pref'd	—	—	24¾	1700
" " " Common	20¼	18¼	18½	1200
Mariposa Land & Min. Co. various.	—	—	7¼	200
St. Louis & Iron Mountain RR.	25½	25	25	2400
Lehigh & Wilkes-Barre Coal Co.	—	—	40	—
Total Shares sold				16002
Sale for the week previous				12251
Increase				3751

* This is a nominal quotation.

BONDS.

	Sales.		Price
Ches. & O. R. R. 6s, 1st. coupon	1,000		@ 36⅜
" " " ex coupon	—		@ 32
Central RR. of N. J. 1st Mtg.	3,000		@115
" " " 1st Cons.	6 000		111¼@112
" " " Convt.	26,000		108½@109
Del. and H. Canal, 1st Mtg. 94'	20,000		@113¾
" " 78, '77	—		@102
" " Reg. '91	1,000		@114
Del., Lack. & W. R. R., 7s, conv.	—		@—
" " " " 2d Mtg.	—		@116
St. Louis & Iron Mount'n 1st Mtg	3.000		@100½
St. Louis & Iron M'tn, 2d Mtg.	1,000		@ 75
Lehigh & Wilkes-Barre Cons.	3,000		@ 99
Total Sales	$64,000		

Closing quotations, in the absence of sales, represent the latest prices bid.

Philadelphia Stocks.

PHILADELPHIA, March 3, 1876.

The feature of the week on this market has again been the activity in the shares of the Pennsylvania RR Co., the transactions aggregating 117,500 shares, closing at a decline of over $1 per share from the highest point attained. The bulk of sales were made at a fraction above 56. Reading RR. stock has been unusually active, the transactions amounting to over 24,000 shares, principally at a decline of about $1 per share from our closing quotations of the 25 inst., the stock closing at $1.25 below the highest point of the week. Lehigh Coal and Navigation Co. stock is firm with sales amounting to over 7,000 shares, closing at 50¼ ex dividend of $1 per share. The favorable condition of this stock is attributable to the favorable report presented to the stockholders at the annual meeting of the company on the 29th ult.

The general market has been irregular during the week, the tendency being towards lower prices.

Bonds are fairly active, with but slight alterations in the majority of quotations.

Coupons and Interest.—The following companies will

pay interest and coupons due on their mortgage bonds during the present month in Philadelphia:

Parclay Coal RR., coupons on the 1st mortgage bonds.

Lehigh Coal and Navigation Co., coupons on their convertible 6 per cent. gold bonds.

Lehigh Valley RR. Co., interest on their 7 per cent. bonds.

Pennsylvania RR. Co., interest on their consolidated mortgage reg. bonds

Philadelphia and Reading RR. Co., coupons on the 1st mortgage bonds of the East Pennsylvania RR. Co.

Schuylkill Navigation Co., interest on the 1st mortgage bonds

United N. J. RR. and Canal Co., loan of 1901, interest paid in gold.

Philadelphia and Reading Coal and Iron Co., interest on the 7 per cent. debenture bonds, and also on the 7 per cent. common bonds.

The Locust Mountain Coal Co. has its semi-annual dividend period during the month.

We note an auction sale of 6 shares of the Allentown Iron Co. at $46½ per share.

Quotations and Sales of Stocks and Bonds,

For the week ending March 2, 1876.

STOCKS.

	Highest	Lowest	Closing	Shr's
Lehigh Valley RR. Co	63¼	62¼	62½	457
Pennsylvania RR.	57⅞	56	56½	117500
Reading RR.	51⅛	50½	50⅝	26450
Lehigh Coal and Nav. Co	50¼	49½	50¼	7247
Penn. Canal	—	—	9	—
Buck Mountain Coal Co.	—	—	30	20
Fulton Coal Co.	—	—	3½	—
Locust Mountain Coal Co	—	—	—	—
Westmoreland Coal Co.	—	—	84	—
St. Nicholas Coal Co.	—	—	1	—
Cambria Iron Co.	—	—	17	500
Crane Iron Co.	—	—	46	—
Emaus Iron Co	—	—	—	—
Pennsylvania Salt Manufact. Co.	—	—	78	30

Total shares sold 152,204
Sales for the week previous 131,310
Increase 20,894

BONDS.

	Sales.	Price
H. and B. T. RR. 1st mortgage, 7s	—	— @109
" " " 2d " "	—	— @104
" " " 3d " cons	2,700	— @ 61½
Lehigh Valley RR. Con. mtg. 6s, Reg	9,000	100¾@101
" " 7s, 1910	5,500	†110½@111
" " 6s Reg	1,000	— @106
Pennsylvania RR., 1st mtge. 6s	2 000	— @105
" gen. " cou. 1910	4,000	— @104
" gen. " 6s, reg.	15,000	— @107
" " Cons. M. 6s cou.	—	— @ 97¾
Phil. & Reading RR. 7s 93	—	— @111
" " G. M. 7s, reg. & cou.	11,000	109 @110
" " " Deb. 6s	2,300	82 @ 82½
" " new convertible 7s	15,300	105½@106
Phil. & Reading C. & I. Co. Deb. 7s	—	— @ 81¾
" " Helfstein tract	7,000	88 @ 88¾
" " Mtge. 7s	—	— @ —
Lehigh Coal & Nav. Co., 6s '84	2,000	— @104½
" " " RR., '97	1,000	— @104
" " " Con m. 7s	—	— @103½
" " " Convt. gold, '97	10,000	106 @106¼
Penn. Canal, 6s	15,000	— @ 75
Penn. and N. Y. Canal, 7s	5,000	— @110
Ches. and Del. Canal, 6s	—	— @ 86
Susquehanna Coal Co. 7s	—	— @ 85
Buck. Mount Coal Co. 6s	—	— @ 97½
Penn. Gas Coal Co. 6s	—	— @100¾

Total amount of sales $106,600

Closing quotations, in the absence of sales, represent the latest prices bid.

† Ex Interest.

Gold and Silver Stocks,

NEW YORK, March 3, 1876.

The mining share market is irregular, and with the exception of the Bonanza stocks, which probably in a measure sustains the market, the majority of stocks tend toward lower prices, a notable feature of the report is the advance in Alpha Consolidated from $27 to $37 per share. Imperial advances to $12 from $8 per share, as in our report of the 25th ult.

Savage.—The stock of this company still continues to decline (the movement being inversely as that of the water in the mine) our present quotation being $16 per share, work has been abandoned in a part of the mine until pumping machinery can be procured, sufficiently powerful to keep the mine clear of water.

California.—Ore of an extraordinary character has just been struck in this mine, by the sinking of an air winze below the 1,500 foot level. It is covered and speckled in every direction with pure silver, and is of greater value than any ever before met with on the Comstock Lode, being richer than the ore of the Consolidated Virginia. The ore in the last named mine is growing still better, and the mills are taxed to their utmost capacity; the yield for the present fiscal month is estimated at from $2,500,000 to $3,000,000. In the north end of the Ophir Mine a good body of ore has been struck on the 1,600 foot level, which indicates the extension of the big bonanza into the adjoining mines. It is announced that the California Mining Company, will begin to pay dividends in May next the first will probably amount to $3 per share.

Recent estimates of the amount of ore in sight in this mine, places the value at $175,000,000, which would require seven years to extract at the rate of $2,000,000 per month.

The Defiance Mine situated in Inyo Co., California, lies about one mile from Darwin, on the east side of Mount Ophir, which is the name of the highest point of the range. The croppings are plainly discernible half way up, jutting out in bold relief on the brow of the mountain. There appear four distinct veins, one above the other, with masses of country rock, between them. They are of different widths—from twenty to sixty feet on the surface and all pitching into the mountain. A tunnel runs in at the foot of the first vein, cutting it obliquely, passing through it into the country rock, through that and through the next vein. It is still being pushed through to cut the four veins.

These veins pitch downward at an angle of about sixty degrees. On the first one a shaft goes down with the incline some one hundred and forty feet. Here they are opening breasts and drifts, and the character of the ore is improving—the gray carbonates, rich in silver, taking place of the galena. The furnace has been completed but a short time, and is found to work well. It has a reducing capacity of thirty tons per day, and is now turning out about one hundred and fifty bars of bullion per day, worth from $150 to $200 each. 259,289 lb. has been shipped since the furnace started. At the furnace about twenty-five men are employed, in three shifts, working night and day.

In the mine between forty and fifty men are employed.

The stock of this company, is principally held in a few hands, and it is expected that they will soon declare their first dividend.—*Bakersfield Courier.*

Recent information from the above mine, states that the north chimney, has been tapped by a drift, from which a high grade of ore is being taken, with 56 per cent. of lead.

QUOTATIONS:

	No. of shares.	Feb. 24.	March 2.
Sierra Nevada	100,000	$22	$20
Union Consolidated	100,000	11	13
Mexican	108,000	26	30
Ophir	108,000	66	66
California	540,000	91	90
Consolidated Virginia	108,000	443	447
Best & Belcher	100,800	64	62
Gould & Curry	108,000	21	21
Savage	112,000	17	16
Hale and Norcross	16,000	52	45
Chollar Potosi	28,000	90	90
Alpha Consolidated	30,000	27	37
Imperial	100,000	8	12
Yellow Jacket	24,000	108	100
Kentuck	30,000	16	16
Crown Point	100,000	25	25
Belcher	104,000	37	38
Overman	38,400	68	73
Caledonia	20,000	53	55
Justice	105,000	25	26
Raymond & Ely	30,000	21	20
Meadow Valley	60,000	3	3
Eureka Consolidated	50,000	16	16
Eureka G. V.	20,000	3	3
Silver Hill	54,000	11	11
Julia	110,000	15	16

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & Co., Bankers and Brokers, room 7 Traveller Building, 31 State street, Boston.

BOSTON, THURSDAY EVENING, March 2, 1876.

The market closes very quiet and looks a trifle stronger. Allouez has declined from $25 one week ago to $20 February 29, and closes strong at $20, bid 8. 30. Calumet has rallied from 169 to 171¼, and has since dropped to 170½. This is the highest point this stock has ever sold at. Copper Falls is in demand at 3⅞ with occasional sales at $4. Duncan silver is steady at 1.60, with sales at 1.62½ and 1.60. Franklin is slightly weaker, and 14 asked after selling at 14½. The Minnesota Mining Company pays (in New York) 50c. dividend March 10. National (after selling at 2½) is strong at 2⅞ bid. The mine has on hand copper to the amount of $12,500, and the same amount in the treasury in cash, making a total of $25,000 and was never looking better than at present. Pewabic is strong at $6, although their product for February was but 25 tons. Quincy is very dull, one sale reported at 39½. Star has sold at ¼, and Madison at the same price.

DESCRIPTION.	Par Value.	No. of Shares.	CLOSING. Bid.	Asked.
Allouez	$50	20 000	$20 00	$22 00
Calumet and Hecla	50	80,000	170 00	170 50
Central	25	20,000	30 00	31 00
Copper Falls	25	20,000	3 87½	4 25
Dana	25	20,000	10	15
Duncan Silver	20	60,000	1 60	1 62½
Franklin	25	20,000	13 50	14 00
Humboldt	25	20.000	10	20
Madisca	25	20,000	20	25
Mesnard	25	20,000	62½	70
Minnesota	25	20,000	†2 50	3 00
National	15	20,000	2 50	3 00
Petherick	25	20,000	38	60
Pewabic	25	20,000	6 00	6 25
Phenix	25	20,000		
Quincy	25	20,000	39 00	40 00
Ridge	25	20,000	5 75	6 25
Rockland	25	20,000	30	37½
International Silver	—	—	20	23
Star	25	20,000	20	25
Superior	25	20,000	12½	15
Eastern RR.				

† Ex Dividend of 50c. per share.

Gas Stocks.

NEW YORK, March 3, 1876.

Gas stocks continue dull and drooping, especially is this the case with the Brooklyn Companies, the stock of which in some instances, exhibits a further decline of $5 per share within the week, as an evidence of the feeling which is so strongly manifested against the gas companies in Brooklyn, we note that sixty-three stores on Grand street, between Leonard and Fourth, have substituted kerosene oil for gas.

The Jamaica Plains, Mass., Gas Light Company, will reduce its price of gas from $4 to $3 50 per thousand cubic feet to private consumers, after April 1st, and will charge the city $3 per thousand feet after same date.

We note a sale of 40 shares of the Lowell, Mass., Gas Light Company, at 143½; and 13 shares of the Lynn, Mass., Gas Light Company, at $96 per share.

We also note recent sales of the Newtown and Watertown, Mass., Gas Company, at 125.

We note recent sales of the San Francisco Gas Company, aggregating over 1,000 shares at from 99¼ to 100, also 274 shares of the Montreal Gas Company, at from 160 to 162.

The Providence, (R. I.) Gas Company has announced that at the close of the present quarter the price of gas will be reduced to $2 25 per thousand feet.

Dividends and Interest.—The Boston Gas Light Company, paid a quarterly dividend of 2½ per cent., amounting to $62,500 on the 1st inst.

Coupons on the bonds of the following gas companies are payable during the present month:

Champaign and Urbana, Ill., GasLight and Coke Company.

Central Gas Light Company.

Citizens' Gas Company, of Rochester, N. Y.

Columbus, Indiana, Gas Company.

Laclede Gas Company, of St. Louis, Mo.

Westchester, New York, Gas Company.

The Northern Liberties Gas Company of Philadelphia, has its semi-annual dividend period during the present month, the day of payment has not yet been announced.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Quotations "bid" and "asked" of New York City and Vicinity Gas Companies are on the $100 of stock and not on one share.

Companies in New York and Vicinity	Cap. Stk.	Par.	last Dividend	When Paid.	Bid.	Askd.
			pr.c			
Mutual, N. Y.	$5,000,000	$ 100	2½	Oct. '75	108	109
" " Bonds	900,00	1,000	3½	Aug. "	105	
NewYork, "	4,000,000		5	Jan. '76	145	149
Metropol. "	2,500,000	100	5	Sept. '75	—	160
" " Certf.	1,000,000	...	3½	" "	103	105½
" " Bonds	500,000	1,000	3¾	July, "	105	
Harlem "	1.850,000	50	4	Feb. '76	130	134
Manhattan "	4,000,000	50	10	Jan. "	270	
Brooklyn, B'klyn	2,000,000	25	5	Nov. '75	190	198
Nassau "	1,000,000	20	4	July, "	—	100
" " Certf.	700,000	1,000	3½	Nov. "	95	98
People's "	1,000,000	10	3½	Jan. '76	65	70
" " Certf.	300,000	1,000	3½	July, '75	85	86
" " Bds	325,000	....	3½	Aug. "		95
Metropol. "	1,000,000	10	3½	May, "	70	75
Wmsburgh "	1,000,000	50	5	July, "	—	142½
" " Certf.	1,000,000	....	3½	July, "	97	100
Citizen's "	1,200,000	20	2½	Jan. '76	100	102
" " Certf.	320,000	1,000	3½	Oct. '75	99	101
J. C. N. J.	386,000	20	5	July, "	160	170
Centl. Westch. N.Y.	466,000	50	4	July, "	100	105

‡ Gold.

Companies out of Town.*	Cap. Stk.	Par	Bid	Askd.
People's " " of J. C.			125	135
Citizen's G. L. Co., Newark, N. J.	1,000,000	50		90
Hempstead " " L. I., N. Y.	40,000	100		100
Jamaica, " " "	25 0.0	100		100
Richmond Co., S. I. "	300,000		100	105
Citizens', Rochester, "		100	60	68
Rochester Gas Co., "		100	50	
‖People's G. L. Co. Albany, "	1,000,000	100	31	40
§Mutual " Buffalo "	750,000	100	45	55
Mutual " Detroit Mich.		50	18	
TroyG. L. Co., Troy, N. Y.			108	
Brockport, N. Y., G. L. Co.	25,000	100		80
†Baltimore G. L. Co., Balt., Md	2,000,000	100	175	180
People's G. L. Co., Balt., Md	2,000,000	25	24⅞	25
Hannibal G. L. Co., Hanni., Mo.	100,000	100	95	100
La Clede, Mo		100	110¼	125
Lewiston G. L. Co., Lewis., Me	400,000	100	33	
Chicago G. L. Co., Chicago, Ill.	2,000,000	100		130
Jacksonville, Ill.	120,000	100	82	
‡Lima, Ohio	60 000	100	10	
Derby G. L. Co., Derby, Conn.	160,000	100		80
Woonskt G. L. Co. Woonskt, R. I.	150,000	100	100	
Fort Wayne G. L. Co. F. W., Ind		100	90	100
North. LibertiesG. L. Co. Phila.		25	29	
Wilkes-Barre G. L. Co W. B. Pa.		50	70	
Washington G. L. Co., Phila.			42	43
Pottsville, Pa., Gas Co.		50	40½	
Portland G. L. Co. Portland, Me	350.000	50	72	75
Hartford G. L. Co., Hartford, Ct	700,000	25	44½	
Boston G. L. Co., Boston, Mass.	2,500,000	500	780	785
Chelsea G. L. Co. Chelsea, "	300,000		139	
Cambridge G. L. Co., Cam., "	700,000		132¾	
Louisville G. L. Co., Louis., Ky.			127	
Cincinnati G. L. Co, Cincin, O.				200
St. Louis G. L. Co		50		160
Laclede G.L. Co., St. Louis, Mo.		100	100	105
Carondelet G. L. Co., Mo.		50		6¾
S. F. G.L. Co. San Francisco, Cal	10,000,000	100	99⅜	100
City G. L. Co. Montreal, Can.	1,440,000	40	160	162
Consumers G. L (old.) Tor., Ont	600,000	50	132	
Hamilton G. L. Co., Ont.	150,000	40	112½	
Halifax G. L. Co., Halifax, N.S.	400,000	40	149	

* These quotations represent the latest obtainable prices at which sales were made.

† This Company has issued $1,000,000 in certificates in addition to their stock indebtedness, on which they pay interest at the rate of 6 per cent. gold.

‡ This Company has $30.000 in bonds outstanding.

§ $200,000 represents the bonded indebtedness of this Company; these bonds have recently been offered at 90.

‖ $300,000 of the indebtedness of this company is represented by bonds.

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Have had several years' experience selling and mining coal, and have a good trade. Address
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FOR THE
RAPID AND ECONOMICAL TRANSPORTATION
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ORES, STONE, COAL, Etc., Etc.,
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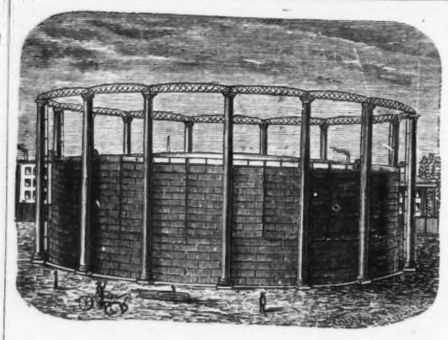
Office of the CHICAGO SILVER MINING CO.,
SALT LAKE CITY, Dec. 1, 1874.

A. S. HALLIDIE.—DEAR SIR: I have the pleasure in stating that your Ropeway, put up at the Chicago Mine, Ophir District, Utah Territory, one year ago last summer, has been in constant use ever since, and with the most satisfactory results.
The line, as you are aware is constructed over an extremely rugged country, one and one-quarter miles in length.
For the first half mile or so, it is down a very steep mountain side, whence it passes over the brow of another one; thence it continues down Dry Cañyon at an angle of fifteen to eighteen degrees.
The structure is an entire success, the entire cost of which has more than been saved already, although it has not been worked up to half its capacity.
In the estimate of earnings no account was taken of supplies sent to the mine, including water, etc., by no means an inconsiderable item. Truly yours. W. S. GODBE,
Manager Chicago S. M. Co. (limited).

Supt. Office EMMA HILL CONSOLIDATED M. Co.,
LITTLE COTTONWOOD, Utah, Dec. 17, 1874.

A. S. HALLIDIE, Esq.: Dear Sir—In answer to your inquiry, I have to report that the Ropeway (built August, 1872), continues to work splendidly, and with but little wear on the rope. It has been everything that was promised, and has proved to be the cheapest way to move ores on mountain sides. Yours very truly, L. U. COLBATH, Sup't.
Send for circular to

A. S. HALLIDIE,
No. 113 PINE STREET, San Francisco, Cal.



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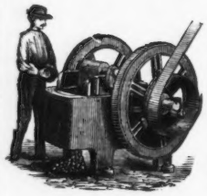

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